UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

OCT 17 2002

In reply refer to:
SWR-02-SA-6055:SRB

Mr. Michael Finan
Chief, Delta Office
U.S. Army Engineer District, Sacramento Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Mr. Calvin C. Fong
Chief, Regulatory Branch
San Francisco District, Corps of Engineers
333 Market Street
San Francisco, California 94105-2197

Dear Mr. Finan and Mr. Fong:

Enclosed is the National Marine Fisheries Service's (NOAA Fisheries) biological opinion prepared pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*), which analyzes impacts to the endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), threatened Central Valley spring-run Chinook salmon (*O. tshawytscha*), and threatened Central Valley steelhead (*O. mykiss*), and their designated critical habitat resulting from Mirant Delta, LLC.'s proposed Aquatic Filter Barrier (AFB) Project at the Contra Costa Power Plant (CCPP) and Pittsburg Power Plant (PPP) and the dredging of the area of Suisun Bay adjacent to the cooling water intake structures at the PPP (Enclosure 1). According to the San Francisco Corps District's letter of August 23, 2001, the work will be undertaken as part of a larger overall conservation program which is detailed in Revision 6 of Mirant's Draft Multispecies Habitat Conservation Plan (CP). Also enclosed in this package are Essential Fish Habitat (EFH) Conservation Recommendations for Pacific coast salmon, Northern anchovy, and starry flounder which may be affected by the proposed actions, prepared pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended (16 U.S.C. 1801 *et seq.*); (Enclosure 2).

Endangered Species Act Consultation

Based on the best available scientific and commercial information, NOAA Fisheries concludes that the placement of the AFBs, dredging, and other conservation activities are not likely to jeopardize the continued existence of the listed species, or result in the destruction or adverse modification of the species' critical habitat. An incidental take statement is included with the biological opinion that identifies reasonable and prudent measures and terms and conditions to implement those measures, to ensure that the impacts of any incidental take are minimized.

Consultation with NOAA Fisheries must be reinitiated if (1) the amount or extent of take specified in the incidental take statement is exceeded; (2) new information reveals that the project may affect listed species in a manner or to an extent not previously considered; (3) the action is subsequently modified in a manner that causes an effect to the listed species that was not considered in the biological opinion; or (4) a new species is listed, or critical habitat is designated that may be affected by the project.

Essential Fish Habitat Consultation

NOAA Fisheries has chosen to include the Reasonable and Prudent Measures and their respective Terms and Conditions listed in the Incidental Take Statements of the Biological Opinion as its EFH Conservation Recommendations for Pacific coast salmon, Northern anchovy and starry flounder. The Corps has a statutory requirement under section 305(b)(4)(B) of the MSFCMA to submit a detailed response in writing to NOAA Fisheries that includes a description of measures proposed for avoiding, mitigating, or offsetting the impact of the activity on EFH, as required by section 305(b)(4)(B) of the MSFCMAA and 50 CFR 600.920(j) within 30 days. If unable to complete a final response within 30 days of final approval, the Corps should provide NOAA Fisheries an interim written response within 30 days, and provide a detailed response at a later date.

If you have any questions concerning this opinion, please contact Susan Boring in our Sacramento Area Office, 650 Capitol Mall, Suite 8-300, Sacramento, CA 95814. Ms. Boring may be reached by telephone at (916) 930-3600 or by FAX at (916) 930-3629.

Sincerely,

Rodney R. McInnis
Acting Regional Administrator

cc: Jan Knight, U.S. Fish and Wildlife Service
Steve Gallo, Mirant Delta LLC

Enclosure 1

Endangered Species Act -Section 7 Consultation

BIOLOGICAL OPINION

Agency: U.S. Army Corps of Engineers, Sacramento and San Francisco Districts

Activity: Mirant Delta, LLC. - Aquatic Filter Barrier and Dredging Projects

Consultation Conducted By: NOAA Fisheries/Southwest Region

Date Issued: OCT 17 2002

I. CONSULTATION HISTORY

The following is a chronology of the consultation history on the Contra Costa Power Plant (CCPP) and the Pittsburg Power Plant (PPP):

November 1993 - Pacific Gas & Electric (PG&E), prior owner of the CCPP and PPP, began discussions with the National Marine Fisheries Service (NOAA Fisheries) and the U.S. Fish and Wildlife Service (USFWS) to obtain take authorization under Section 10 of the Endangered Species Act (ESA) for the operation of the CCPP and PPP.

December 1993 - May 1997 - NOAA Fisheries had multiple meetings with PG&E and the USFWS to draft a Habitat Conservation Plan for the CCPP and the PPP.

September 1995 - Draft HCP submitted by PG&E to USFWS, NOAA Fisheries, and CDFG.

July 7, 1997 - Meeting with USFWS, NOAA Fisheries, and CDFG regarding HCP.

October 3, 1997 - Draft HCP submitted to USFWS, NOAA Fisheries, and CDFG for review.

September 1998 - PG&E submitted a draft HCP and Incidental Take Permit Applications to NOAA Fisheries for review.

August 10, 1998 - Draft-Revision 3 of HCP submitted to USFWS, NOAA Fisheries, and CDFG.

September 24, 1998 - NOAA Fisheries and the USFWS jointly published a Federal Register Notice of the submittal and availability for review of the draft HCP and Environmental

Assessment for the CCPP and PPP.

April 1999 - Mirant Delta, LLC (Mirant), then Southern Energy Delta LLC, purchased the CCPP and PPP from PG&E and resubmitted PG&E's application for an incidental take permit.

July 23, 1999 - Mirant (then Southern Energy) submitted HCP revision 4 to the USFWS and NOAA Fisheries, incorporating changes to address comments made by public commenters on the PG&E Revision 3 of the HCP.

November 16, 1999 - NOAA Fisheries met with representatives of Mirant to discuss HCP.

May 24, 2000 - NOAA Fisheries met with Mirant. At this meeting, Mirant introduced a new alternative conservation measure, the use of an aquatic filter barrier (AFB) at the CCPP and PPP to minimize the impact of the cooling water intake structures on aquatic species, to the previously proposed conservation measures in the HCP.

June 7, 2000 - Letter from NOAA Fisheries to Southern Energy California commenting on proposed Design, Operations, and Maintenance of the Aquatic Filter Barrier (AFB).

June 2000 - Mirant issued CP rev 5 to USFWS, NOAA Fisheries, and CDFG, incorporating changes to add the Aquatic Filter Barrier(AFB)(Gunderboom) using a phased approach of conservation measures (AFB and Variable Speed Drives (VSD)), and at the CCPP the proposed construction and operation of Unit 8.

January 30, 2001 - NOAA Fisheries received a copy of the Draft Revision 6 of the Mirant Delta HCP and Appendices for the CCPP and PPP. The proposed project design and implementation of the AFB were included.

February 14, 2001 - Mirant met with USFWS, NOAA Fisheries, and CDFG; USFWS informed Mirant that, due to staff shortages it could not commit to review CP Revision 7 under any specific timeframe and further recommended that Mirant take steps to apply directly to agencies to implement conservation program.

April 20, 2001 - Public Notice from the Army Corps of Engineers, Sacramento District (Sacramento Corps), regarding the proposed AFB placement at the CCPP was received by NOAA Fisheries.

April 25, 2001 - Letter from Sacramento Corps received by NOAA Fisheries asking for initiation of consultation under Section 7 of the Endangered Species Act for a Corps permit application for Mirant Delta, LLC's AFB Project at the CCPP.

June 6, 2001 - Mirant met with NOAA Fisheries, USFWS and CDFG to discuss the Section 10 ITP/HCP Process and NOAA Fisheries and USFWS indicated that their respective biological opinions would be available in October 2001.

August 22, 2001 - Letter from the Army Corps of Engineers, San Francisco District (San Francisco Corps), received by NOAA Fisheries asking for initiation of consultation under Section 7 of the Endangered Species Act for an Army Corps of Engineers permit application for Mirant in regard to the deployment, operation, maintenance, repair and evaluation of an AFB and for dredging of the area of Suisun Bay adjacent to the cooling water intake structure at the PPP.

October 18, 2001 - Meeting between NOAA Fisheries, Mirant, and Jones and Stokes to discuss the consultation process on the CCPP and PPP and timetable for process.

October 23, 2001 - Letter received by NOAA Fisheries from The Huffman-Broadway Group, Inc. clarifying and restating the decisions made at the October 18 meeting.

October 30, 2001 - Letter sent from NOAA Fisheries to the Sacramento Corps clarifying the scope of the NOAA Fisheries' biological opinion that will be issued on the actions to be undertaken at the CCPP.

II. DESCRIPTION OF THE PROPOSED ACTION

A. Introduction and General Summary

The Department of the Army proposes to issue 5-year permits under authority of Section 10 of the Rivers and Harbors Act to Mirant Delta, LLC (Mirant) for the placement of Aquatic Filter Barriers (AFB) at the CCPP and PPP as well as dredging which will take place at the PPP. The U.S. Army Corps of Engineers, Sacramento District and the San Francisco District are the federal lead agencies. The proposed AFB Project is intended to reduce entrainment and impingement of aquatic species at the CCPP and the PPP.

Mirant has proposed to modify the operation, maintenance and repair of the CCPP and PPP (located in Contra Costa County in the Sacramento San Joaquin Delta) as part of a comprehensive conservation program intended to reduce entrainment and impingement of aquatic species at the power plants. In order to begin implementing the conservation program (including operational modifications), Mirant has submitted three permit applications to the U.S. Army Corps of Engineers, one to the Sacramento District and two to the San Francisco District. As described in more detail below, these permit applications are for necessary components of the proposed conservation program and operation of the plants. In addition, one of the permit applications is for a dredging activity that is necessary for the continued operation of the PPP. Because Mirant proposes to operate the plants pursuant to a conservation program so as to minimize and fully mitigate the impacts of plant operation, the scope of this consultation covers the proposed permit activities and the associated operation, maintenance, and repair of the CCPP and PPP and other mitigation actions under the conditions specified in Mirant's proposed conservation program.

The activities falling within the scope of this project are described below. This section first briefly describes the permit applications. It next provides a brief description of key elements of

the conservation program. The general description of the key elements of the conservation program is followed by a more detailed description of how CCPP and PPP will be operated, maintained, and repaired according to the conservation program, including, for both plants: (i) a description of the power plant circulating and auxiliary water flows, (ii) the phased approach to minimizing and mitigating the effects of this aspect of power plant operation (including implementation of the aquatic filter barrier program, variable speed drive program, and the Montezuma Enhancement Site program); (iii) a description of maintenance and repair activities and various mitigation measures for these activities; and (iv) a description of construction activities necessary to implement the conservation program. Finally, this section describes the maintenance dredging project, and concludes with a description of the action area.

B. Proposed Permits

1. Sacramento District Permit

Mirant has submitted a Department of the Army permit application to the Sacramento District that, if approved, would authorize the placement of the AFB in navigable waters and limited discharge of dredge or fill material and placement of works in navigable water associated with the deployment, operation, maintenance, repair, monitoring and evaluation of an Aquatic Filter Barrier (AFB) that would be placed immediately offshore of the CCPP in the San Joaquin River. The AFB is a component of the conservation program for the operations of the CCPP.

2. San Francisco District Permit

a. Aquatic Filter Barrier (AFB)

Mirant has submitted a Department of the Army permit application to the San Francisco District that would authorize the placement of the AFB in navigable waters and the discharge of dredge or fill material and placement of works in navigable water associated with the deployment of an AFB immediately offshore of the PPP in Suisun Bay. The AFB is a component of the conservation program for the modified operations of the PPP.

b. Dredging of the Cooling Water Intake Structure

Mirant also submitted a separate Department of the Army Consolidated Dredging-Dredged Material Reuse/Disposal Permit application to undertake maintenance dredging at the cooling water intake structure (CWIS) for the PPP. The dredging program is necessary for continued operations at the PPP and will improve environmental performance of the CWIS with regard to entrainment and impingement.

C. Conservation Program and Overall Operations of the Plants

The permits described above are necessary for the implementation of the conservation program described and analyzed in the document entitled Draft Revision 6, Multispecies Habitat

Conservation Plan, Pittsburg and Contra Costa Power Plants (January 30, 2001) [hereinafter referred to as the "HCP"] as amended. The HCP was developed by Mirant in consultation and cooperation with the US Fish & Wildlife Service (USFWS), National Marine Fisheries Service (NOAA Fisheries) and the California Department of Fish & Game (CDFG). The primary purpose of the HCP is a proposed conservation program for the overall operation, maintenance and repair of the CCPP and PPP to minimize and mitigate to the maximum extent practicable the impact of "take" to species listed as threatened or endangered under the federal Endangered Species Act, 16 U.S.C. § 1531 et seq. The applications submitted to the Army Corps would, in the case of the applications for installation of the AFB, implement key conservation measures identified in the HCP. The application for dredging is necessary for the operation of the PPP and to improve environmental performance.

A brief description of the conservation program is provided below. This is followed by a more detailed description of how the CCPP and the PPP will be operated according to the conservation program.

1. Conservation Program

Mirant has developed an integrated proposal for operating, maintaining and repairing the CCPP and PPP, located on the south shore of the San Joaquin River and Suisun Bay, respectively, in accordance with various conservation measures, including conservation and enhancement activities at the Montezuma Enhancement Site, located on the north shore of Suisun Bay about 1 mile west of the town of Collinsville and approximately equidistant between the CCPP and PPP. This proposal is documented in part in the HCP. The goal of the conservation program is to ensure that the current and future operation, maintenance, and repair of Mirant's CCPP and PPP will, to the maximum extent practicable, minimize and mitigate any potential impact the plants may have on threatened, endangered, and sensitive species while, at the same time, maintain the ability of the two power plants to continue to supply a reliable source of electricity to the Bay Area regional power grid. This conservation program is a phased program, utilizing adaptive management principles in which information gathered from Phase I at the CCPP is used to determine the scope of actions in Phase II at both the CCPP and PPP.

The focus of the HCP is on (a) HCP-covered fish species potentially affected by the operation of the power plants' circulating water systems, (b) HCP-covered fish and terrestrial species potentially affected by the power plants' maintenance and repair activities and, (c) HCP-covered fish and terrestrial species that may be affected by enhancement and restoration activities at the Montezuma Enhancement Site. A central feature of the HCP is the demonstration and evaluation of technology to minimize the entrainment of sensitive fish species. A number of other conservation measures are proposed as a part of the conservation program and are described in section 4 of the HCP. These conservation measures are designed to modify the future operation, maintenance, and repair of the power plants in order to eliminate, reduce, or compensate for the effects of the plants on listed species identified in Mirant's HCP and which may be found in the PPP HCP Area, CCPP HCP Area, and Montezuma Enhancement Site HCP Area. The conservation program includes measures suggested by USFWS, NOAA Fisheries, and CDFG as

being desirable, necessary or appropriate for purposes of minimizing to the maximum extent practicable the impacts of the overall operation, maintenance and repair of the power plants on listed species. The majority of the conservation measures generally benefit threatened or endangered fish species; however, a number of other conservation measures will protect threatened or endangered plant and wildlife species. Those conservation measures involving habitat enhancement and restoration will generally benefit both terrestrial and aquatic HCP-covered species.

The primary purpose of the AFB is to screen cooling water used by the PPP and CCPP in order to substantially reduce the potential for juvenile and larval fishes to be entrained in the existing cooling water intake system of the power plants and reduce impingement that would otherwise exist on the existing fish screens. The phased evaluation of the AFB relative to the Variable Speed Drive (VSD) program is a key element of this conservation program. However, the AFB technology has never been tested in the Delta or on the scale proposed. The conservation program includes the monitoring and evaluation of the effectiveness of the AFB at excluding larval and juvenile fishes. If effective, the AFB technology will be implemented at both power plants. The phases of the conservation program will be generally implemented as described in section 4 of the HCP and as are summarized below.

a. Primary Conservation Measures

The primary conservation measures that comprise Mirant's proposed conservation program are set forth in Section 4 of the HCP. The conservation measures will be implemented in a phased approach in order to enable the USFWS, NOAA Fisheries, CDFG and Mirant to evaluate the effectiveness of each conservation measure to ensure that the impacts of take of listed species are appropriately minimized and mitigated. The monitoring program associated with these conservation measures is described in Section 5 and Appendices H and I of the HCP. The phased approach to implementation of conservation measures involves three primary coordinated conservation programs: the placement of the AFB, implementation of the variable speed drive, and restoration, enhancement, and conservation activities at the Montezuma Enhancement Site.

i. Aquatic Filter Barrier Program. Recently, a new aquatic filter barrier system has been undergoing several years of demonstration tests at the Lovett Generating Station on the Hudson River, New York. This system consists of a two-layer 0.6 mm thick filter fabric made of nonwoven fibers that creates a porous filtering media with an equivalent mesh opening of 0.212 mm (supplemental holes 0.5 mm in diameter were punched 6.4 mm on center to aid in overall porosity), suspended from a flotation boom, weighted bottom, an air burst cleaning system, and concrete anchoring blocks and attachment lines. The system was first deployed in 1994 as a pilot program, and has been continued in each subsequent year with increasing success. In a one-month study during initial 1997 deployment, the fabric barrier was found to have reduced entrainment of aquatic organisms by more than 80% (Ecological Analysts Inc. 1998) as compared to a non-protected adjacent unit. During a longer subsequent study, entrainment was reduced by 76% (Applied Science Associates 1998) prior to a gap forming under one end of the

AFB, allowing unfiltered water to enter the plant. The Lovett Generating Station is sited in an estuarine environment with daily tidal elevation changes and velocities similar to the CCPP.

The proposed AFB program consists of the phased deployment, operation, maintenance, repair, monitoring and evaluation of an aquatic filter barrier (AFB) or Gunderboom™ Marine Life Exclusion System (MLES™). The AFB is designed to exclude larval and juvenile fishes from being entrained in the cooling water intake structure of the power plants and will be installed first and monitored and evaluated at the CCPP. If the AFB is determined effective during Phase I at the CCPP, then it would be deployed, operated, maintained, repaired and evaluated at the PPP during Phase II. The AFB will, at a minimum, be operated from February 1 through July 31 annually. However, the AFB would ordinarily remain deployed and operational on a year-round basis. Generally, it would be removed only if it needed cleaning, repair, or replacement of parts or equipment that could not otherwise be accomplished *in situ*. Mirant has submitted two permit applications, one each to the Sacramento and San Francisco Army Corps of Engineers to implement the AFB conservation measures.

The AFB is, in brief, a non-woven synthetic curtain that would be installed around cooling water intake units of the power plant. The AFB curtain would act as a barrier between the power plant intake structure and the fish populations within the water column. It would consist of a porous non-woven fabric made of polypropylene and polyethylene fibers with supplemental maximum openings of approximately 2.0 millimeters (mm) to 2.38 mm (3/32") in diameter. The curtain would be comprised of two layers of fabric, panelized by sewing the front and back together into eight-foot vertical panels. Segments of the panelized curtain would be joined by a connection system to facilitate installation and maintenance. The curtain would run between the bottom of the hood, just below the surface of the water, to the connection point of the anchor/sealing foot, spanning the entire depth of the water column. It is designed to screen cooling water and thereby prevent juvenile and larval fish that potentially could pass through existing screens, from being entrained within the cooling water system. Because the AFB is designed to allow for very slow water infiltration rates (approximately 0.02 feet/second approach velocities), it is expected to significantly reduce the probability of impinging aquatic organisms as compared to the current screens (3/8" mesh and 1.5-2.0 feet/second approach velocity at the fish screens) at the plants.

ii. Variable Speed Drive Program The VSD program consists of Mirant's commitment to operate the circulating water pumps at the PPP in VSD mode in Phase I for the period from February 1 through July 31 in order to minimize entrainment and impingement of sensitive fish species and provide sufficient cooling water to operate the power plant. When the circulating pumps operate in the VSD mode, the speed of the circulating water pumps increases or decreases as the unit load increases or decreases within a prescribed range. The amount of circulating water flow increases or decreases in proportion to the speed of the circulating pumps. As the quantity of circulating water from the Delta decreases, it is expected that entrainment impacts will be likewise reduced. The VSD Program will also serve as a back-up conservation measure at both plants if AFB is deployed and implemented. The VSD program would also be used at both the PPP and the CCPP in the event that the AFB does not achieve conservation goals. If

certain VSD program thresholds are not achieved, then Mirant will commit to compensation as specified in the next section of this biological opinion.

iii. Montezuma Enhancement Site Program Mirant will include, as part of the operation, maintenance and repair of the plants, the implementation of habitat restoration, enhancement and conservation activities at the Montezuma Enhancement Site. The Montezuma Enhancement Site is a 139-acre site on which a conservation easement will be conveyed to protect several species. The site was formerly diked and farmed in the past and was used as a waterfowl hunting club. Habitat restoration and enhancement activities will be undertaken to provide net benefits for selected listed species. Some areas of the Montezuma Enhancement Site will be left in their current condition to avoid disturbing habitat likely to be occupied by listed species. A conceptual plan has been developed with the goal of increasing the availability of near shore habitat used by sensitive aquatic species as well as identified terrestrial species. A conservation easement over the Montezuma Enhancement Site will be conveyed to CDFG. It is anticipated that Mirant would use all reasonable efforts to develop a detailed site-specific enhancement plan for the MES promptly upon issuance of biological opinions from NOAA Fisheries and the USFWS, seek and obtain all necessary permits, and implement this conservation measure in the early stages of Phase II.

The phased conservation program with respect to each of the two power plants is described in more detail below.

2. The Conservation Program and Power Plant Circulating and Auxiliary Water Flows

a. Contra Costa Power Plant Circulating and Auxiliary Water Flows:

As described in Section 3 and 4 of the HCP, the operation of the CCPP circulating and auxiliary water flows includes the following activities. Circulation water is withdrawn from the Delta through the cooling water intake structure used for condenser cooling and then the heated water is discharged to the Delta. Auxiliary and service water is also withdrawn from the Delta and used for equipment cooling systems, boiler water make-up, fire control and miscellaneous uses. Section 3 of the HCP, as amended, identifies and describes the circulating water system.

The CCPP also utilizes Delta water for service and auxiliary water systems. Service and auxiliary water that is not supplied through the Unit 6 & 7 circulating water system is described as follows. The service and auxiliary water uses include screen wash pumps that withdraw water downstream of the Unit 6 & 7 traveling screens. This water is used to clean traveling screens. Service water pumps also withdraw water for use in supplying boiler makeup water and equipment cooling waters from the Unit 1-3 circulating water inlet tunnels downstream of the Unit 1-3 screens. A fire pump for emergency use, system testing, and flushing is located at both Unit 1-5 discharge canal and the Unit 6 & 7 discharge canal withdrawing water through inlets required to be unscreened to avoid blockage. These auxiliary and service water systems utilize approximately 16,000 acre-feet of water per year.

Units 1-3 and 4-5 were built in 1951 and 1953 respectively. These Units used circulating water for power production since that time until 1995 when the circulating pumps for those units ceased. Circulating water is no longer delivered to these units. Units 1-5, at operating capacity used 1678 acre-feet per day of water for circulating flows, relative to the 1382 acre-feet per day at operating capacity for Units 6 and 7 and the proposed Unit 8. Due to a number of environmental concerns, including sensitive species, air pollution, water use, coupled with the age of the older units and their efficiency, Mirant decided, as is discussed in the draft HCP, not to overhaul and refurbish Units 1-5, but to discontinue their use.

Key measures from the conservation program are integrated into the above-described activities as follows: (i) Phase I for deploying and evaluating the AFB; (ii) Phase II, where the VSD program may be implemented in place of the AFB; and (iii) a number of additional conservation measures that will be implemented concurrently with Phases I and II.

The CCPP will be operated, maintained and repaired in accordance with the conservation program described in the HCP in order to minimize to the maximum extent practicable the impacts of the power plant on listed aquatic and terrestrial species. The minimization program will be evaluated by Mirant in conjunction with the USFWS, NOAA Fisheries, and CDFG after the first 5 years and, as proposed in the HCP, after each subsequent 5-year period of any Incidental Take Permit issued pursuant to Section 10(a)(1)(B) of the ESA to assess the effectiveness of the program, along with the additional evaluation of the AFB during its first years of operation.

i. Contra Costa Power Plant Phase I: Aquatic Filter Barrier In Phase I, the AFB will be deployed, operated, maintained, repaired, monitored and evaluated at the CCPP for a sufficient period of time to determine its efficacy at reducing or eliminating entrainment of sensitive aquatic organisms as well as evaluating the attendant impacts to other aquatic organisms. The AFB would enclose 8 acres of the Delta waters, and approximately 3.2 acres of this enclosed area would comprise shallow water habitat (less than 4 meters in depth). In Phase I, the AFB will be placed around the CCPP Units 6 & 7 cooling water intake structure to prevent or reduce the number of sensitive aquatic species from entering the cooling water intake.

The effectiveness of the AFB will be determined by a Biological Monitoring and Evaluation Program (BMEP) (App. H of the HCP) that would estimate, both outside and inside the AFB, the abundance of larval and juvenile fish species identified in the draft HCP. The BMEP may be refined by Mirant in consultation with a technical team comprised of representatives of the USFWS, NOAA Fisheries, and CDFG. AFB effectiveness will be determined during an intensive, but limited duration (three years unless extended by mutual agreement of Mirant, the USFWS, NOAA Fisheries, and CDFG), on-site entrainment study in substantial accordance with a conceptual BMEP developed for the CCPP as described in Appendix H of the HCP. The AFB demonstration will be performed from February through July; however, Mirant notes that it intends to operate, maintain and repair (as necessary) the AFB on a year-round basis. The AFB would be removed from the water only as necessary for repair, maintenance, cleaning or

replacement. Monitoring results and, in particular, impacts on sensitive fish species will determine the efficacy of the AFB technology in preventing entrainment of listed species.

The AFB will be deemed successful if the monitoring program at the CCPP shows that it achieves, on average, the exclusion of eighty (80) percent to ninety-nine (99) percent of the entrainable sensitive aquatic species found outside of the AFB. If that is the case, then the AFB conservation measure will continue to be implemented at the CCPP and will be implemented at the PPP in Phase II.

If, however, the AFB achieves the exclusion, on average, of between twenty (20) and eighty (80) percent of the entrainable sensitive aquatic species found outside the AFB, a joint decision will be made by the USFWS, NOAA Fisheries, CDFG and Mirant whether further modifications, evaluation or testing is desirable and whether the AFB technology should remain at the CCPP and if it should be implemented at the PPP. If the USFWS, NOAA Fisheries, and the CDFG determine that further evaluation at the CCPP is undesirable, then AFB would be removed at the CCPP and would not be implemented at the PPP and the VSD program will remain the primary conservation measure for reducing entrainment of sensitive species at both the CCPP and the PPP during Phase II.

The AFB will be deemed to be unsuccessful if after a period of evaluation deemed sufficient by USFWS, NOAA Fisheries and CDFG, the AFB fails to exclude, on average, greater than twenty (20) percent of the entrainable sensitive aquatic species found outside of the AFB. In such event, Mirant, in conjunction with USFWS, NOAA Fisheries and CDFG may decide to remove or retain the AFB at CCPP and not implement it at PPP.

The overall AFB program will be evaluated annually by Mirant in conjunction with the USFWS, NOAA Fisheries, and CDFG for three years, or Mirant may, in consultation with the USFWS, NOAA Fisheries, and CDFG, extend the program for a longer period of time. The physical integrity of the AFB will also be monitored on a regular basis (to be specified in a monitoring plan) in a manner substantially similar to the manner set forth in the Physical Monitoring and Maintenance Program (PMMP) described in Appendix I of the HCP. Results of the monitoring program will be reported to the resource agencies on an annual basis.

Because the plant's cooling water will be filtered by passing through the AFB, it will not be necessary to implement VSD Flow Program with use of the VSDs to reduce circulating water pump usage, to have a 7-day running average flow, or to clean and rotate the existing intake screens to maintain through screen velocities. However, the VSD program, including the circulating pumps and rotating screens would be maintained as backup to the AFB in the event the AFB is damaged or destroyed and requires repair or replacement.

ii. Contra Costa Power Plant Phase II: AFB Program If the AFB program is found to be effective during Phase I, then it will continue to be used during Phase II. The VSD program will be used as a contingency measure in the event the AFB is damaged or destroyed. If the AFB has not been determined effective, the VSD program would commence in lieu of the AFB program.

iii. Contra Costa Power Plant Phase II: VSD Program If the VSD program is used at the CCPP, the operation of the plants will be modified to reduce intake flows by 5% below design capacity for Units 6 and 7 and 100% reduction for Units 1-5 (combined reduction of 57% from base flows), based on a 7-day running average (8,970 acre-feet) during the February through July period. For Contra Costa Units 6 & 7, when minimum unit load demand occurs (~25-45MW), then the circulating water pumps operate at minimum speed, and the circulating water flow is 50% of design capacity. As load demand increases, the circulating water pumps increase speed resulting in a concomitant increase in cooling water to the unit(s). When the unit reaches approximately one third to one half of design capacity (approximately 90 to 145 MW), the circulating water pumps operate at 95% of allowable speed and water volume, the maximum amount allowed under VSD operation. In order for the units to operate at full design capacity, the pumps need to be placed in "by-pass mode", thereby allowing 100% of pump speed and flow to be achieved. River water temperature, tide, condenser vacuum, and steam flow have an effect on the amount of circulating water flows required. By operating the circulating water pumps in VSD mode, over a 7-day running average, circulating water flows will be reduced to 95% of design capacity (5% below design capacity).

Mirant is proposing to build another generating unit, Unit 8. Once completed, Unit 8's cooling tower make-up water will be obtained entirely from reuse of discharge water from the existing Units 6 and 7 discharges. Unit 8 is anticipated to use up to 17 cfs of makeup water from the discharge of Units 6 & 7. However, in the unlikely event that units 6 and 7 are not operating, Unit 8 will require the operation of one circulating pump that provides 85 cfs from the Delta, even though only 17 cfs are anticipated to be used by that Unit.

VSD Compensation

Load demands may require that the units be taken out of VSD mode. If the target reduction threshold is exceeded, monetary compensation shall be provided, based on the compensation method described below. The annual amount, if any, will be calculated toward the end of the year, typically in November, after the fall mid-water trawl index for delta smelt has been determined. It is the intent of this formula that, although delta smelt is used as an index, such index serve as a surrogate for all aquatic species, including salmonids but excluding striped bass, impacts of the CCPP and PPP. Compensation shall be based on the diversion of water for cooling, auxiliary and service water at the CCPP and PPP. The compensation is based on a two-part system: a) the VSD program and b) the AFB system. Mirant will also compensate for operations through habitat enhancement and conservation at the Montezuma Enhancement Site. Under the VSD program, compensation shall be based on the amount of water used by the power plants and a delta smelt abundance factor.

Calculation of Compensation

The following formulae shall be used:

Monetary compensation (MC)
Delta smelt fall midwater trawl index (DSFMTI)
Delta smelt fall midwater trawl index Factor (DSFMTIF)

Water Diversion Factor (WDF)

The WDF shall be calculated, based on circulating, service and auxiliary water flows recorded at the PPP and CCPP as follows:

February 1 - July 31 = $0.45/acre foot of water diverted

August 1 - January 31 = $0.045/acre foot of water diverted

The DSFMTI Factor shall be calculated as follows:

Delta Smelt Fall Midwater Trawl Index factor

Fall Midwater Trawl Index	Multiplication factor
<239	= 0.80
240-600	= 0.60
601-1000	= 0.40
>1000	= 0.20

$MC = ((WDF) x (DSFMTIF) x (Acre feet of water diverted)

Water diversion factor * Delta Smelt Fall Midwater Trawl Index factor * Acre-feet of water diverted= total compensation in dollars

Compensation Example

Example:

Projected Total compensation for Pittsburg Power Plant

PPP: 2/1 to 7/31 621,000 AF (Circulating, auxiliary and service flows at full design)
8/1 to 1/31 628,000 AF (Circulating, auxiliary and service flows at full design)

Assume historic delta smelt abundance is quite low (e.g. 230) which would use the DSFMTIF of 0.80

MC = $\sum$ [($0.45) x 621,000 x (0.80)] + [($.045) x 628,000 x (0.8)] = **$246,168**

Contra Costa compensation, using same formulas listed above, would be:

Contra Costa Power Plant
2/1 to 7/31 253,000 AF (Circulating, auxiliary and service flows at full design)
8/1 to 1/31 256,000 AF (Circulating, auxiliary and service flows at full design)

MC = $\sum$ [($0.45) x 253,000 x (0.80)] + [($0.045) x 256,000 x (0.8)] = **$120,536**

$\sum\sum$MC for PPP and CCPP = **$$366,704**

Clearly, as flows decrease and delta smelt abundance increases, the mitigation compensation would decrease.

AFB Damaged

If the AFB Program is in place and operating, there shall, under ordinary circumstance be no monetary compensation. As long as the AFB had not been determined ineffective by CDFG, the USFWS, NOAA Fisheries, and Mirant, then Mirant is under a continuing obligation to take prompt and reasonable measures to maintain, repair and operate the AFB.

If the AFB develops a tear, a hole, or is overtopped (e.g. events that cause a short-term performance problem) as described in the CP, Mirant shall use the VSD Program as a fallback conservation measure. If such condition occurs, monetary compensation would be provided under the VSD formula above, and water usage shall be calculated, based on the percentage of water estimated to bypass the AFB.

If 20 percent of the water used is estimated to overtop the AFB or enter through a tear for a month period, say July, before it could be repaired, if 45,000 AF are used in July, monetary compensation would be as follows:
MC= ($0.45 (WDF)) x (.80 (DSFMDIF) x (.20 (water bypassing AFB)) (45,000 AF (water used during period at issue)) = $3,240

If AFB was totally non-functional during the period, then the following MC calculation would take place:

MC= ($0.45/AF) x (.80) x (1) x (45,000) = $16,200

Dedicated Account and Approval of Expenses

Funds would be paid in the following year by the end of February but would require that the delta smelt abundance index be made available to Mirant. Funds would be placed by the CDFG into a dedicated account to be used for enhancement, creation, and conservation of habitat beneficial to

listed fishes or candidate fishes for listing and shall be expended only on approval of the USFWS, NOAA Fisheries, and CDFG.

b. Pittsburg Power Plant Circulating and Auxiliary Water Flows:

Per the conservation program, the operation of the PPP circulating and auxiliary water flows includes the following activities. Circulation water is withdrawn from the Delta through the cooling water intake structure used for condenser cooling and then the heated water is discharged in the Delta. Auxiliary and service water is also withdrawn from the Delta and used for equipment cooling systems, boiler water make-up, fire control and other miscellaneous uses. These auxiliary systems utilize approximately 42,000 acre-feet of water per year. Section 3 and 4 of the HCP, as amended, identifies and describes the circulating water system.

PPP will be operated, maintained and repaired in accordance with the conservation program described in the HCP in order to minimize to the maximum extent practicable the impacts of the power plant on listed aquatic and terrestrial species. The minimization program will be evaluated by Mirant in conjunction with the USFWS, NOAA Fisheries, and CDFG after the first 5 years and, as proposed in the HCP, after each subsequent 5-year period of any Incidental Take Permit issued pursuant to Section 10(a)(1)(B) of the ESA to assess the effectiveness of the program.

The PPP will be operated under the VSD Flow Minimization Program during Phase I, as described above. If AFB is determined to be successful at the CCPP, then AFB will be implemented at the PPP during Phase II. These phases are described in more detail below.

i. Pittsburg Power Plant Phase I: VSD Program Under Phase 1, the PPP would operate under the variable speed drive (VSD) program during the February through July period. The PPP and CCPP are equipped with circulating water pumps that can operate at full speed or variable speed drive. Normally, the circulating water pumps operate at full speed (Bypass Mode) all the time, so the circulating water flows are at a maximum (100% of design capacity). When the circulating water pumps operate in VSD mode, the speed of the circulating water pumps increases and decreases as the unit load increases and decreases over a prescribed range, as described below. The amount of circulating water flows increases and decreases in proportion to the speed of the circulating water pumps, as described below.

Typically at the PPP Units 1-4, when the load demand for these units is at a minimum (approximately 30-35 MW), then the circulating water pumps operate at minimum speed, and the circulating water flow is 70% of design capacity. When load demand increases, the circulating water pumps increase speed resulting in a concomitant increase in cooling water to the unit(s). When the unit reaches approximately one third to one half of design capacity (approximately 45 to 60 MW), the circulating water pumps are operating at 95% of allowable speed and water volume, the maximum amount allowed under VSD operation. In order for the units to operate at

full design capacity, the pumps need to be placed in "by-pass mode", thereby allowing 100% of pump speed and flow to be achieved.

The PPP Units 5 & 6 are equipped with similar VSD pumps, but with slightly different minimum load and circulating water pump speed. When there is a minimum unit load for these units (~25-45 MW), then the circulating water pumps operate at minimum speed, and the circulating water flow is 50% of design capacity. As load demand increases, the circulating water pumps increase speed resulting in a concomitant increase in cooling water to the unit(s). When the unit reaches approximately one third to one half of design capacity (approximately 90 to 145 MW), the circulating water pumps are operating at 95% of allowable speed and water volume, the maximum amount allowed under VSD operation. In order for the units to operate at full design capacity, the pumps need to be placed in "by-pass mode", thereby allowing 100% of pump speed and flow to be achieved. River water temperature, tide, condenser vacuum, and steam flow have an effect on the amount of circulating water flows required. By operating the circulating water pumps in VSD mode, over a 7-day running average, circulating water flows will be reduced to 80% of design capacity (20% below design flow). Unit 7 is a modified mechanical draft wet-cooling system and uses only makeup water from the Delta.

Mirant will operate the PPP circulating water pumps in VSD mode with an 86°F discharge outfall temperature criteria as specified in the 1995 national Pollutant Discharge Elimination System (NPDES) Permit or successor permit. The 86°F temperature limitation is triggered by entrainment thresholds and densities of fishes and is designed to increase survival of species entrained in the cooling water system. The 86°F refers to a condition of the 1995 NPDES permit for the operation of the CCPP and the PPP known as the Resource Management Program. The VSD program will reduce cooling water flow rates to minimize impacts to sensitive aquatic organisms that may otherwise be subject to entrainment and impingement. Minimization of impacts caused by circulating water flows will be attained by operating the circulating water pumps at the power plant intakes in VSD mode for the period of February 1 through July 31. Under normal operations, the circulating water pumps are operated at full capacity, regardless of the units' generation output. When the circulating water pumps are operated in the VSD mode, reducing the speed of the circulating water pumps when the units run at lower loads reduces the intake of circulating water. By reducing the intake of water, the entrainment and impingement of sensitive species is reduced. The additional cost of fuel to operate in VSD mode can, however, be significant. If the AFB technology is implemented at PPP, the VSD program will be discontinued and used only as a backup system in the event of AFB failure.

VSD Compensation Program

Load demands may require that the units be taken out of VSD mode. If the target reduction threshold is exceeded, monetary compensation would be provided for delta smelt and winter-run Chinook salmon as described above for the CCPP.

ii. Pittsburg Power Plants Phase II: AFB If the results of the biological monitoring and evaluation program at CCPP demonstrate that the AFB technology meets the success criteria

described above, AFB will then be deployed, operated, maintained, repaired, monitored and evaluated at the PPP in lieu of the VSD program. The existing screens and VSD pumps will be maintained for use as backup to the AFB program should the AFB be damaged or destroyed. The AFB will be subject to a biological monitoring and evaluation program and physical monitoring and maintenance program similar to that used at the CCPP. If, however, the AFB technology is not judged effective at the CCPP, the VSD program will be continued at the PPP as described in Phase I, above. Criteria by which AFB is determined successful or unsuccessful at the PPP will be the same or substantially similar to that described above for the CCPP.

If the AFB is deployed at the PPP, Mirant will deploy the AFB around the Units 1-7 intakes between February 1 and July 31 of each year, at a minimum, when sensitive fish species are most susceptible to entrainment. However, it is Mirant's intent to operate the AFB on a year round basis and remove the AFB as may be necessary for cleaning, repair or replacement. Based on results of studies conducted on a similar AFB at another power plant and the additional measures proposed for the PPP, it is expected that entrainment impacts will be reduced by approximately 80-99 percent. Deployment of the AFB is expected to also result in reducing impingement of most larvae, juveniles, and adult aquatic organisms due to expected flow through barrier velocities of about 0.02 feet per second (fps).

Because the plant's cooling water will be filtered by passing through the AFB, it will not be necessary to implement VSD Program with use of the VSD pumps to reduce circulating water pump usage, to have a 7-day running average flow, or to clean and rotate the existing intake screens to maintain through screen velocities. However, the VSD program, including the circulating pumps and rotating screens would be maintained as a "backup" to the AFB in the event the AFB is damaged or destroyed and requires repair or replacement.

The minimization of impacts is based on a seasonal (or year-round) deployment of the AFB to reduce entrainment and impingement losses of larvae and juvenile sensitive aquatic species. As was previously discussed in Phase I above, entrainment has been previously identified as the single largest impact of the operation of the PPP, accounting for up to 99.8% of the combined number of fish estimated to be entrained or impinged on an annual basis at full design flow. Additionally, the period of February 1 through July 31 was selected in consultation with the USFWS, NOAA Fisheries, and CDFG, as the period during which larval and juvenile fishes would most benefit from this conservation measure. This conclusion was based on a review of results from the 1978-1979 316(b) studies (Ecological Analysts, Inc. 1981a) and the 1986-1992 Striped Bass Monitoring Program.

3. Montezuma Enhancement Site (MES) Actions

Mirant proposes to restore, enhance and conserve aquatic and terrestrial habitat for selected HCP-covered species at the 139 acre Montezuma Enhancement Site by restoring tidal flow and access by creating openings (about 100 feet in width) at the Sacramento River and Marshall Cut. A conceptual plan has been developed to achieve restoration and enhancement of habitat to support a suite of species covered by the HCP (See Section 4 of Mirant's HCP). Detailed

planning of habitat restoration, enhancement and conservation plan will begin as soon as the biological opinions are issued. A working group of relevant state and federal agencies will be convened to develop a detailed habitat restoration plan. Once the final plan is approved by all necessary parties and all necessary permits are issued, implementation will begin. Restoration work is anticipated to be initiated in the first permissible construction period after the specific restoration plan is approved. More specific actions are as follows:

- Convey a Conservation Easement pertaining to the real property commonly known as the Montezuma Enhancement Site, County of Solano, consisting of approximately 139 acres of undeveloped land to CDFG for the conservation and protection of the sensitive species identified in this plan. The conservation easement will be conveyed to CDFG upon completion of habitat enhancement activities on site. Such easement will remain in effect in perpetuity.

- Restore tidal flow at the Montezuma Enhancement Site by creating openings (about 100 ft in width) at the Sacramento River and Marshall Cut.

- Recontour portions of the Montezuma Enhancement Site to create three dead-end sloughs of approximately 50 ft in width and 350 ft in length.

- Recontour the three constructed dead-end sloughs on the Montezuma Enhancement Site to increase the available tidal, intertidal, and upper tidal zones.

- Increase the quantity and enhance the quality of northern coastal salt marsh and coastal brackish marsh on the Montezuma Enhancement Site.

- Contribute funding to complete the restoration and enhancement of the Montezuma Enhancement Site as described in section 7 of the draft HCP.

- Maintain existing fencing to control access to the site.

This basic plan has been evaluated and deemed feasible in a general overview by wetland restoration experts. A more detailed explanation of the evaluation process to date is contained in section 4-4.3 of the draft HCP. More specific details of the reconstruction will be provided in the Montezuma Enhancement Site Plan are described in section 4-4.2 of the draft HCP. All reasonable efforts would be made to complete conservation measures at the MES during the early stages of Phase I.

4. Plant Maintenance and Repair Activities

As noted above, because Mirant proposes to operate the plants pursuant to a conservation program to minimize and fully mitigate the impacts of plant operation, the scope of the analysis within this Opinion includes the operation, maintenance, and repair of the CCPP and PPP per Mirant's proposed conservation program. The activities falling within the scope of this project

include the operation, maintenance and repair at the two plants. The overall operation, maintenance and repair of the CCPP and PPP are discussed in Section 3 of the HCP, as amended. Mirant's conservation program addresses the activities that may result in incidental take of sensitive fish, wildlife, or plant species. Such activities may include:

- Maintenance and repair of power plant facilities, including, but not limited to, all related buildings, structures (including intake, AFB panel replacement and repair, AFB replacement as necessary, resetting or moving anchors and other maintenance and repair necessary to operate the AFB, shoreline maintenance, other screening systems and intake forebay dredging), fixtures, improvements, land and water uses, equipment, machinery, and operational accouterments and appurtenances.

- Maintenance and repair of electric transmission and distribution systems, whether above or below ground, including, but not limited to, all related towers, poles, transformers, anchor lines, anchors, vaults, manholes, and access roads, together with other related fixtures, equipment, machinery, improvements, and operational accouterments and appurtenances.

- Maintenance and repair of electrical substations, including all related buildings, structures, land uses, poles, lines, anchor lines, anchors, pads, transformers, towers, together with other operational improvements, fixtures, equipment, machinery, and operational accouterments and appurtenances.

- Maintenance and repair of telecommunication systems, including all related buildings, structures, land uses, towers, poles, antennae, vaults, lines, switches, and other related fixtures, equipment, machinery, improvements, and operational accouterments and appurtenances.

- Maintenance and repair of natural gas and fossil fuel systems, including, but not limited to, all related buildings, structures, storage facilities, pipes, equipment, fixtures, equipment, machinery, improvements, and operational accouterments and appurtenances.

- Maintenance and repair of other facilities, above or below ground or water, such as, but not limited to, roads, access routes, vegetation, waterways, fences, fuel lines, water pipes, conduits, antennae, or lines of any kind, together with other related fixtures, poles, towers, equipment, machinery, improvements, and operational accouterments and appurtenances.

- Maintenance and repair of all structures, facilities, and equipment, above or below ground, in or out of water, necessary or appropriate for maintaining, inspecting and monitoring the AFB.

The following measures are designed to minimize impacts on endangered and threatened species.

a. Employee Training Program

Mirant will develop and implement an employee-training program for all personnel working within the plants. Mirant will submit a draft employee training program to the USFWS, NOAA Fisheries, and CDFG for their review and approval within 30 days after the final biological opinions are issued; the agencies will then have 90 days to review and comment on the draft program, and the program will be implemented within 90 days after a final program is agreed to by all parties. The Employee Training Program will consist of a brief discussion of endangered species biology and the legal protections afforded these species, a discussion of the biology of the sensitive species, the habitat requirements of these species, their status under the ESA and the California Endangered Species Act, measures being taken for the protection of these species and their habitats under the Project Description, and a review of the conservation measures being implemented by Mirant. A fact sheet conveying this information will also be distributed to all employees working in the project area.

b. Materials and Waste Management

Mirant will continue to implement a materials and solid waste management program to, in part, ensure that special precautions are taken with regard to the impacts of materials usage and storage on listed species. The existing materials management program and solid waste management plan will be reviewed and modified as necessary to minimize risk of injury or death to listed species in the event of a spill or leak of waste. In addition, Mirant will prohibit littering and continue to implement measures to ensure a clean and safe workplace.

c. Staging and Storage

All staging and storage of equipment and materials related to placement of the AFB and any other work, to the extent practicable, will take place on previously disturbed areas.

5. Monitoring

Monitoring will be an important part of the proposed actions at the two power plants. These monitoring efforts will help determine if the AFB is successful and if it should be deployed. Additionally, the effectiveness of the VSD program will also be monitored to determine if it is effective in reducing take of listed species. Further details of the monitoring programs can be found in the draft HCP.

a. Monitoring proposed at the Contra Costa Power Plant

The AFB will be monitored to determine its effectiveness and ability to reduce take of listed species. Biological monitoring, including fish sampling, will also be conducted to determine the effectiveness of the AFB to exclude larval and juvenile fishes from the cooling water. Details of

the planned BMEP can be found in Appendix H of the draft Conservation Plan. A PMMP is presented in the HCP in Appendix I and will be implemented to develop information on the physical integrity and performance of the AFB. Annual reports will be distributed to the USFWS and NOAA Fisheries by January 31 of the following year. In the event that the AFB does not perform as expected and the VSD Program goes into effect in lieu of the AFB program, then cooling water flows will be monitored to determine the amount of water taken by the power plant. Details of these monitoring program can be found in Section 5 of the draft Conservation Plan.

b. Monitoring proposed at the Pittsburg Power Plant

The VSD program will be monitored to determine how effective it is at reducing take of listed fish. The cooling water flows will also be monitored to determine the amount of water taken by the power plant. Details of these monitoring programs can be found in Section 3 of the draft Conservation Plan. Annual reports will be distributed to the Service by January 31 of the following year.

6. Construction Activity

Generally, construction activity at the plants is limited to those activities required for the proposed deployment, operation, maintenance, repair and evaluation of the AFB and are elaborated upon in the HCP and described in the application submitted by Mirant to the Corps of Engineers. However, Unit 8 is approved for construction and may be constructed at the CCPP. The construction and operation of Unit 8 were the subject of a previous consultation between the USFWS, NOAA Fisheries, EPA, and Mirant. Construction activity would be limited to that described in the HCP, as set forth below and as described previously during the construction process with regard to Unit 8.

a. Contra Costa Power Plant Construction Activities:

The conservation program involves the following construction activities, which are further described in the HCP and the application submitted by Mirant to the Sacramento District Corps of Engineers.

- Removal of riprap and emergent vegetation in an area of approximately twenty feet wide by forty-feet long along the shoreline at the CCPP in order to anchor and seal each end of the AFB and the placement of sandbags or sheet piling along each end of the AFB. This construction activity will take place prior to the deployment of the AFB.

- In the alternative to the above measure, a smaller amount of shoreline riprap and vegetation would be disturbed and sheet piling would be driven in the shoreline and the AFB would be affixed to the sheet piling. No sandbags would be required.

- Placement of an AFB of approximately 1,700 feet long in the water column in a semicircular arc, encompassing an area of approximately eight acres; including placement of the AFB on the bottom sediments comprising an area of approximately 15-20 feet wide along the length of the AFB; installation of anchors, monitoring instruments, tethering lines, and airlines.

- Connection of Unit 8 water supply/return system to Units 6 and 7 cooling water discharge system.

- In the unlikely event that the river bottom is not sufficiently smooth to attain an effective seal between the AFB foot and the river bottom, then a barge-mounted backhoe with a grading bar mounted on the bucket (scoop) would be used to produce a smooth level grade on which the AFB foot could be placed. Such action would be necessary only if the bottom is so irregular as to prevent a seal between the AFB foot and the river bottom

b. Pittsburg Power Plant Construction Activity

The conservation program may involve the following construction activities, which are further described in the HCP and the application submitted by Mirant to the San Francisco District Corps of Engineers. The AFB would be deployed and operated only if it was determined to be successful at CCPP. Should the AFB be deployed at the PPP, those activities which may result in incidental take of sensitive fish, wildlife or plant species include:

- Removal of riprap and limited quantities of emergent vegetation in an area of approximately twenty feet wide by forty-feet long (0.04 acres) along the shoreline at the PPP in order to anchor and seal each end of the AFB and placement of sandbags around the ends of the AFB or in the alternative driving of sheet piling in the shoreline area to which each end of the AFB would be attached.

- Placement of an AFB of approximately 3,200 feet long in the water column in a semicircular arc, encompassing an area of approximately twenty-eight acres; including placement of the AFB on the bottom sediments comprising an area of approximately 15 feet wide over the length of the AFB; installation of approximately 140 concrete anchors (7 'X 7' X 4') comprising some 0.16 acres, monitoring instruments, tethering lines and airlines.

- In the unlikely event that the river bottom is not sufficiently smooth to attain an effective seal between the AFB foot and the river bottom, a barge-mounted backhoe with a grading bar mounted on the bucket (scoop) would be used to produce a smooth level grade on which the AFB foot could be placed. Such action would be necessary only if the bottom is so irregular as to prevent a seal between the AFB foot and the river bottom.

- Placement of sandbags or sheet piling along each end of the AFB.

D. Maintenance Dredging at Cooling Water Intake Structure at Pittsburg Power Plant

Mirant also submitted a separate Department of the Army Consolidated Dredging-Dredged Material Reuse/Disposal Permit application to undertake dredging at the cooling water intake structure for the PPP. The Department of Army permit authorizing dredging will be issued for a period of 5 or 10 years. The dredging is anticipated to take place in two areas: a) within and immediately in front of the existing concrete cooling water intake structure (between the bar racks and the pumps) that will result in the removal of approximately 500 cubic yards of silt annually and b) dredging of the channel from the intake structure face to the main river channel at 4 – 5 year intervals, depending on siltation factors, of between 20,000 and 50,000 cubic yards. The work is anticipated to take place with a clamshell dredge with bottom-dump scows. More specific information is provided in the Consolidated Dredging-Dredged Material Reuse/Disposal Application, previously submitted to the Army Corps. The aquatic disposal site would be at SF-9 located in Carquinez Strait. Dredging is proposed to take place during the summer months; however, if sedimentation results in safety and reliability issues with the plant or creates approach velocity that increases entrainment and impingement, dredging may be warranted at periods other than the summer months. In such event, the USFWS and NOAA Fisheries will be consulted. Dredging would take place from near the shoreline intake out to a depth approaching 14-16 feet. The proposed dredge design depth is approximately 14 feet.

The maintenance dredging is necessary for the operation of the PPP and also should result in conservation benefits to several species listed as threatened or endangered under the ESA and CESA. The proposed dredging is needed due to the accumulation and accretion of sediments at the exiting cooling water intake structure. The accumulation of sediments has increased the average velocity at the face of the intake structure. The removal of accumulated sediments should lower of the average intake velocity that, in turn, should reduce potential entrainment impacts to larval and juvenile fishes that inhabit the Delta. Silt has accumulated to such an extent that cooling water now includes a substantial sediment load. The silt and sediment in the circulating water have caused abrasion and undue wear of PPP's cooling condenser tubes. The abrasion and wear of the condenser tubes requires additional maintenance work and potentially threatens normal power production at the PPP. Further, if this situation is not remedied, it could eventually force Mirant to scale-back or terminate production of power at the PPP. Maintenance dredging would eliminate this problem. Maintenance dredging contributes to Mirant's overall conservation program goals and is required for the overall operation of the PPP.

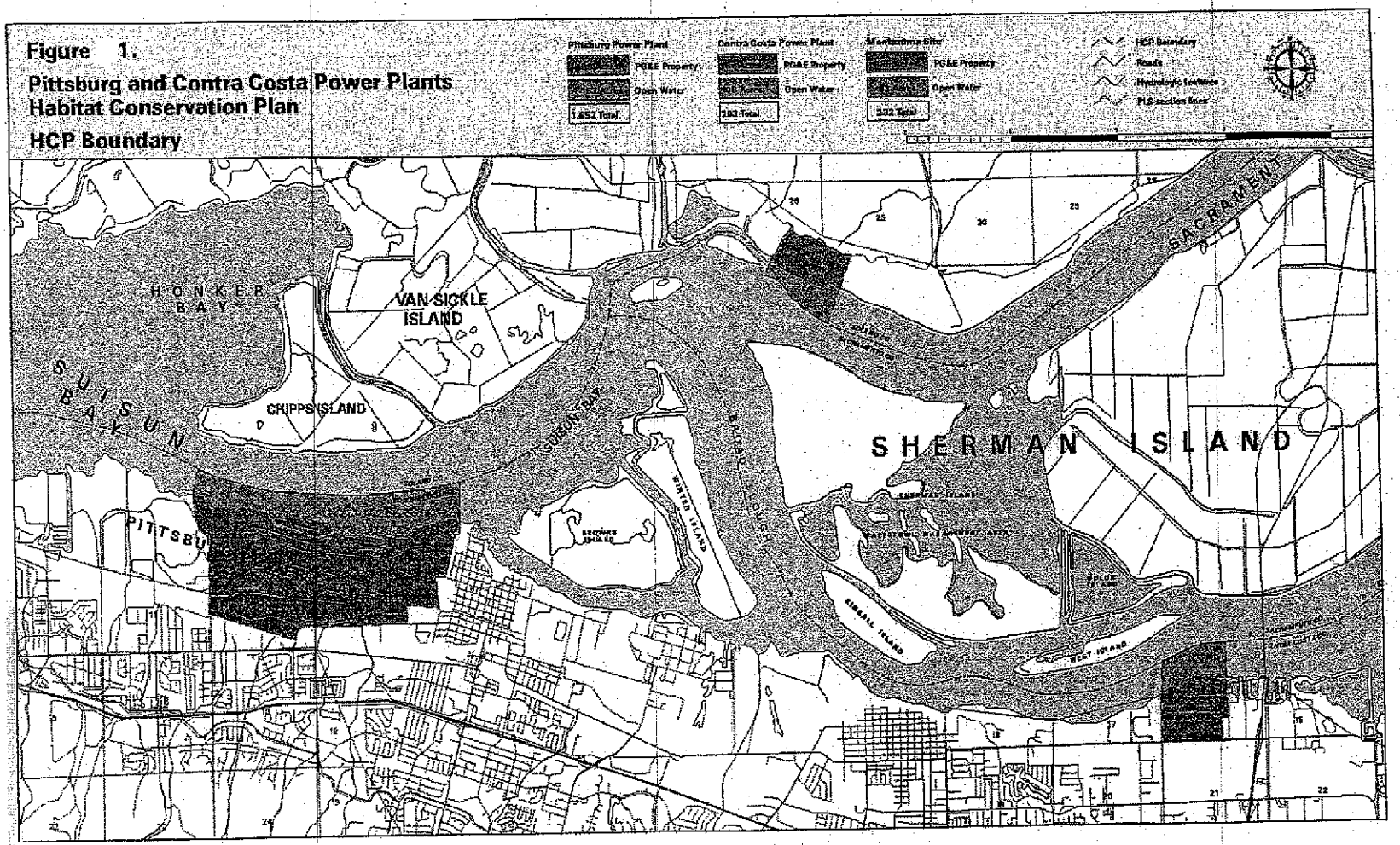
E. Action Area of Proposed Project

The proposed action area is (i) the PPP property as described in Mirant's HCP and the area immediately offshore of the PPP, (ii) the CCPP property and the area immediately offshore of the CCPP, (iii) the Montezuma Enhancement Site and the area immediately offshore of the MES. The action areas are depicted in Figure 1. These areas are described more fully below.

Pittsburg Power Plant Action Area: the parcel of land bounded on the northerly side by the Contra Costa/Solano County line; bounded on the easterly side by the Pittsburg City limit line and its northerly prolongation to said County line; bounded on the southerly side by the following described line: beginning at the intersection of said Pittsburg City limit line with the southerly line of the old Sacramento Northern Railroad right-of-way and running westerly along said Railroad right-of-way line to the northwest corner of APN 85-270-035, thence southerly along the westerly boundary line of APN 85-270-035 to the northerly boundary line of Willow Pass Road, thence westerly along the northerly boundary line of Willow Pass Road to the northerly boundary line of APN 96-100-024, thence westerly along said northerly boundary line to the northwest corner of APN 96-100-024, thence southerly along the westerly boundary line of APN 96-100-024 to the northerly boundary line of the Atchison, Topeka and Santa Fe Railroad (AT&SFRR), thence westerly along said AT&SFRR boundary line to the westerly boundary line of Section 12, Township 2 North, Range 1 West, MDB&M, and the end of said line; bounded on the westerly side by a line described as follows: beginning at the intersection of the northerly boundary line of said AT&SFRR with the westerly boundary line of said Section 12, and running northerly along said westerly boundary line of Section 12 approximately 3,000 feet to the center of an unnamed Slough, thence following the center line of said slough in a circular route heading westerly and northerly until said line intersects said County line.

Contra Costa Action Area: the parcel of land bounded on the northerly side by the Contra Costa/Sacramento County line; bounded on the westerly by the westerly boundary line of the parcels of land described and designated PARCEL ONE and PARCEL TWO in the deed from American Securities Company to Pacific Gas and Electric Company, dated September 28, 1948, and recorded in Book 1304 of Official Records at page 308, Contra Costa County Records and the northerly prolongation of the westerly boundary line of said PARCEL TWO to said County line; bounded on the southerly side by the northerly boundary line of Wilbur Road; and bounded on the easterly side by the easterly boundary line of said PARCEL ONE and PARCEL TWO and the easterly boundary line of the parcel of land described in the deed from Jeni Mori and Italo Mori, wife and husband to Pacific Gas and Electric Company, dated February 14, 1949, and recorded in Book 1431 of Official Records at page 127, Contra Costa County Records, and the northerly prolongation of said easterly boundary line of PARCEL TWO to said County line.

Figure 1.
Pittsburg and Contra Costa Power Plants
Habitat Conservation Plan
HCP Boundary



The Montezuma Enhancement Site Action Area: the parcel of land bounded on the easterly side by the easterly boundary line of the parcel of land described and designated PARCEL NO. THREE in the deed from Hazel L. Stratton to Pacific Gas and Electric Company, dated September 21, 1964, and recorded in Book 1294 of Official Records at page 628, Solano County Records and its southerly prolongation to the Solano/Sacramento County line; bounded on the southerly side by said Solano/Sacramento County line; bounded on the westerly side by the westerly boundary line of said PARCEL NO. THREE and its southerly prolongation to said County line; and bounded on the northerly side by a line which begins at the most easterly corner of said PARCEL NO. THREE and runs westerly along the northerly boundary line of said PARCEL NO. THREE to its intersection with the southerly boundary line of Stratton Road, thence leaving said northerly boundary line and running westerly along said southerly boundary line of Stratton Road to its intersection with said westerly boundary line of said PARCEL NO. THREE and the terminus of said line.

The action area boundaries for each of the three sites extend into the adjacent water bodies to include potential monitoring locations described in the HCP.

F. Summary of Proposed Action

The analysis in this biological opinion focuses on the Corps' issuance of 5-year permits for the deployment of the Aquatic Filter Barriers at CCPP and PPP and issuance of a 5 or 10-year permit for dredging at the PPP. During the permit term, Mirant proposes to operate the plants pursuant to a conservation program so as to minimize and fully mitigate the impacts of plant operation. Therefore, the scope of the analysis in this Opinion includes the current and projected overall operation, maintenance, and repair of the CCPP and PPP per Mirant's proposed conservation program for the next 5 years. The following activities are interrelated and interdependent with the issuance of the Corps permits: (a) overall operations including cooling, auxiliary, and makeup water intake and discharge of the two power plants; including the operation of the proposed Unit 8 at the CCPP; (b) maintenance and repair at the two plants, including activities associated with the construction of Unit 8; (c) all aquatic species monitoring activities at the power plants; and (d) enhancement, restoration and monitoring activities at the Montezuma Enhancement Site.

III. STATUS OF THE SPECIES/CRITICAL HABITAT

This biological opinion analyzes the effects of the AFB, dredging project, and associated conservation actions on the following threatened and endangered species and their designated critical habitats:

- Sacramento River winter-run Chinook salmon - endangered
- Central Valley spring-run Chinook salmon - threatened
- Central Valley steelhead - threatened

Sacramento River Winter-run Chinook Salmon. Sacramento River winter-run Chinook were listed as endangered in January, 1994 (59 FR 440). NOAA Fisheries reclassified this ESU which had been formerly listed as threatened in November 1990 (55 FR 46515). The impetus for reclassification was recognition that the population had dropped by almost 99% over a 25-year period (1966-1991), and despite conservation measures, abundance continued to decrease (National Marine Fisheries Service (NMFS) 1997). Long-term trends in abundance of winter-run are determined based on annual counts of spawners passing over the Red Bluff Diversion Dam (RBDD) ladders. Run size declined from an average of 86,000 adults in 1967-1969 to only 2,000 by 1987-1989, and the trend continued downward to an average 830 fish in 1994-6. Since then, run size has seen an increase to an average of 3,136 fish for the period of 1998-2001. A proposed recovery plan was published in August, 1997 (NMFS 1997).

Historically, Sacramento River winter-run Chinook comprised healthy spawning populations in the McCloud, Pit, Little Sacramento, and Calaveras Rivers. Construction of Shasta dam in the 1940's eliminated access to all of the historic spawning areas. At present this ESU has been reduced to a single spawning population located in the mainstem Sacramento River below Keswick Dam (NMFS 1997). The secondary causes for continual declines in abundance are construction and operation of the RBDD, adverse temperature and flow conditions caused by Shasta Dam, and other anthropogenic influences that collectively degrade spawning and rearing habitat; all of the effects of these actions may be exacerbated by natural environmental variability including poor ocean conditions.

Adult winter-run Chinook salmon generally leave the ocean and migrate through the Sacramento-San Joaquin Delta to the upper Sacramento River from December through May (NMFS 1997). The majority of winter-run Chinook salmon spawning occurs upstream of RBDD; however, some spawners utilize gravel below the dam. The spawning phase of winter-run Chinook salmon primarily occurs from May through July, and the upper preferred water temperature for spawning adult Chinook salmon is 55°F (Chambers 1956) to 57°F (Reiser and Bjornn 1979). The eggs are fertilized and buried in the river gravel (redds) where they incubate and hatch in approximately a two-month period. Eggs are deposited within the gravel where incubation, hatching, and subsequent emergence takes place. Optimum substrate for embryos is a mixture of gravel and cobble with a mean diameter of one to four inches with less than 5% fines, which are less than or equal to 0.3 inches in diameter (Platts et al. 1979, Reiser and Bjornn 1979). Optimum temperature range for Chinook salmon egg incubation is 44°F to 54°F (Rich 1997). Emergence of the fry from the gravel begins during early July and continues through September. Juveniles redistribute themselves and rear in the Sacramento River from July through April. The seaward migration of juveniles may occur as early as August and can continue through April depending on streamflow conditions and hydrologic conditions. All emigrating juvenile Sacramento River winter-run Chinook salmon use the lower reaches of the Sacramento River and the Delta for rearing and as migration corridor to the ocean. January through March are critical months for juvenile winter-run in the Delta (NMFS 1997). Outmigrants may utilize tidal marsh areas, non-tidal freshwater marshes, and other shallow water areas in the Delta as rearing areas for short periods prior to the final portion of their emigration to the sea.

Sacramento River Winter-run Chinook Salmon Critical Habitat. On June 16, 1993, NOAA Fisheries designated critical habitat for the winter-run Chinook salmon (58 FR 33212). Critical habitat for the winter-run Chinook salmon includes the Sacramento River from Keswick Dam (RM 302) to Chipps Island (RM 0) at the westward margin of the Sacramento-San Joaquin Delta; all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge; and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge.

Within the Sacramento River, critical habitat includes the river water, river bottom (including those areas and associated gravel used by winter-run Chinook salmon as a spawning substrate), and the adjacent riparian zone used by fry and juveniles for rearing. In areas westward from Chipps Island, including San Francisco Bay to the Golden Gate Bridge, it includes the estuarine water column, essential foraging habitat, and food resources used by the winter-run Chinook salmon as part of their juvenile outmigration or adult spawning migration.

Central Valley Spring-run Chinook Salmon. The Central Valley spring-run Chinook salmon ESU was listed as threatened by NOAA Fisheries on September 16, 1999 (64 FR 50394). Historically, spring-run Chinook salmon were predominant throughout the Central Valley, occupying the upper and middle reaches of the San Joaquin, American, Yuba, Feather, Sacramento, McCloud, and Pit Rivers, with smaller populations in most other tributaries with sufficient habitat for over-summering adults (Stone 1874, Rutter 1904, Clark 1929). The Central Valley drainage as a whole is estimated to have supported spring-run Chinook salmon runs as large as 600,000 fish between the late 1880s and 1940s (CDFG 1998). Before the construction of Friant Dam, nearly 50,000 adults were counted in the San Joaquin River (Fry 1961). Following the completion of Friant Dam, the native population from the San Joaquin River and its tributaries was extirpated. Also, spring-run no longer exist in the American River due to Folsom Dam.

Clark (1929) estimated that originally there were 6,000 miles of salmon habitat in the Central Valley system and that 80% of this habitat had been lost by 1928. Yoshiyama et al. (1996) calculated that roughly 2,000 miles of salmon habitat was actually available before dam construction and mining, and concluded that 82% is not accessible today. Clark (1929) did not give details about his calculation. Whether Clark's or Yoshiyama's calculation is used, only remnants of the salmon's former range remain accessible today in the Central Valley (CDFG 1998).

Impassable dams block access to most of the historical headwater spawning and rearing habitat of Central Valley spring-run Chinook salmon. In addition, much of the remaining, accessible spawning and rearing habitat is severely degraded by elevated water temperatures, agricultural and municipal water diversions, unscreened and poorly screened water intakes, restricted and regulated streamflows, levee and bank stabilization, and poor quality and quantity of riparian and shaded riverine aquatic (SRA) cover.

Natural spawning populations of Central Valley spring-run Chinook salmon are currently restricted to accessible reaches in the upper Sacramento River, Antelope Creek, Battle Creek, Beegum Creek, Big Chico Creek, Butte Creek, Clear Creek, Deer Creek, Feather River, Mill Creek, and Yuba River (CDFG 1998; USFWS, unpublished data). With the exception of Butte Creek and the Feather River, these populations are relatively small, ranging from a few fish to several hundred. Butte Creek returns in 1998 and 1999 numbered approximately 20,000 and 3,600, and in 2000 and 2001 they numbered approximately 4,000 and 9,500, respectively (CDFG unpublished data). On the Feather River, significant numbers of spring-run Chinook, as identified by run timing, return to the Feather River Hatchery. However, coded-wire-tag information from these hatchery returns indicates substantial genetic introgression has occurred between fall-run and spring-run Chinook populations in the Feather River due to hatchery practices. Spring-run Chinook salmon adults are estimated to leave the ocean and enter the Sacramento River from March to July (Myers et al. 1998). This run timing is well adapted for gaining access to the upper reaches of river systems, 1,500 to 5,200 feet in elevation, prior to the onset of high water temperatures and low flows that would inhibit access to these areas during the fall.

Throughout this upstream migration phase, adults require streamflows sufficient to provide olfactory and other orientation cues used to locate their natal streams. Adequate streamflows are also necessary to allow adult passage to upstream holding habitat in natal tributary streams. The preferred temperature range for spring-run Chinook salmon completing their upstream migration is 38°F to 56°F (Bell 1991; CDFG 1998).

When they enter freshwater, spring-run Chinook salmon are immature and they must stage for several months before spawning. Their gonads mature during their summer holding period in freshwater. Over-summering adults require cold-water refuges such as deep pools to conserve energy for gamete production, redd construction, spawning, and redd guarding. The upper limit of the optimal temperature range for adults holding while eggs are maturing is 59°F to 60°F (Hinz 1959). Unusual stream temperatures during spawning migration and adult holding periods can alter or delay migration timing, accelerate or retard mutations, and increase fish susceptibility to diseases. Sustained water temperatures above 80.6°F are lethal to adults (Cramer and Hammack 1952; CDFG 1998).

Adults prefer to hold in deep pools with moderate water velocities and bedrock substrate and avoid cobble, gravel, sand, and especially silt substrate in pools (Sato and Moyle 1989). Optimal water velocities for adult Chinook salmon holding pools range between 0.5-1.3 feet-per-second and depths are at least three to ten feet (G. Sato unpublished data, Marcotte 1984). The pools typically have a large bubble curtain at the head, underwater rocky ledges, and shade cover throughout the day (Ekman 1987).

Spawning typically occurs between late-August and early October with a peak in September. Once spawning is completed, adult spring-run Chinook salmon die. Spawning typically occurs in gravel beds that are located at the tails of holding pools (USFWS 1996). Spring-run adults have been observed spawning in water depths of 0.8 feet or more, and water velocities from

1.2-3.5 feet-per-second (Puckett and Hinton 1974). Eggs are deposited within the gravel where incubation, hatching, and subsequent emergence takes place. Optimum substrate for embryos is a mixture of gravel and cobble with a mean diameter of one to four inches with less than 5% fines, which are less than or equal to 0.3 inches in diameter (Platts et al. 1979, Reiser and Bjornn 1979). The upper preferred water temperature for spawning adult Chinook salmon is 55° F (Chambers 1956) to 57° F (Reiser and Bjornn 1979).

Length of time required for eggs to develop and hatch is dependant on water temperature and is quite variable, however, hatching generally occurs within 40 to 60 days of fertilization (Vogel and Marine 1991). In Deer and Mill creeks, embryos hatch following a 3-5 month incubation period (USFWS 1996). The optimum temperature range for Chinook salmon egg incubation is 44° F to 54° F (Rich 1997). Incubating eggs show reduced egg viability and increased mortality at temperatures greater than 58° F and show 100% mortality for temperatures greater than 63°F (Velson 1987). Velson (1987) and Beacham and Murray (1990) found that developing Chinook salmon embryos exposed to water temperatures of 35°F or less before the eyed stage experienced 100% mortality (CDFG 1998).

After hatching, pre-emergent fry remain in the gravel living on yolk-sac reserves for another two to four weeks until emergence. Timing of emergence within different drainages is strongly influenced by water temperature. Emergence of spring-run Chinook typically occurs from November through January in Butte and Big Chico Creeks and from January through March in Mill and Deer Creeks (CDFG 1998).

Post-emergent fry seek out shallow, near shore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. As they grow to 50 to 75 mm in length, the juvenile salmon move out into deeper, swifter water, but continue to use available cover to minimize the risk of predation and reduce energy expenditure. The optimum temperature range for rearing Chinook salmon fry is 50°F to 55 °F (Boles et al. 1988, Rich 1997, Seymour 1956) and for fingerlings is 55°F to 60°F (Rich 1997).

During most years, in Deer and Mill creeks, juvenile spring-run Chinook spend 9-10 months in the streams, although some may spend as long as 18 months in freshwater. Most of these "yearling" spring-run Chinook move downstream in the first high flows of the winter from November through January (USFWS 1996, CDFG 1998). In Butte and Big Chico creeks, spring-run Chinook juveniles typically exit their natal tributaries soon after emergence during December and January, while some remain throughout the summer and exit the following fall as yearlings. In the Sacramento River and other tributaries, juveniles may begin migrating downstream almost immediately following emergence from the gravel with emigration occurring from December through March (Moyle, et al. 1989, Vogel and Marine 1991). Fry and parr may spend time rearing within riverine and/or estuarine habitats including natal tributaries to the Sacramento River, non-natal tributaries to the Sacramento River, and the Delta. In general, emigrating juveniles that are younger (smaller) reside longer in estuaries such as the Delta (Kjelson et al. 1982, Levy and Northcote 1982, Healey 1991). The brackish water areas in estuaries moderate the physiological stress that occurs during parr-smolt transitions. Although

fry and fingerlings can enter the Delta as early as January and as late as June, their length of residency within the Delta is unknown but probably lessens as the season progresses into the late spring months (CDFG 1998).

In preparation for their entry into a saline environment, juvenile salmon undergo physiological transformations known as smoltification that adapt them for their transition to salt water (Hoar 1976). These transformations include different swimming behavior and proficiency, lower swimming stamina, and increased buoyancy that also make the fish more likely to be passively transported by currents (Saunders 1965, Folmar and Dickhoff 1980, Smith 1982). In general, smoltification is timed to be completed as fish are near the fresh water to salt water transition. Too long a migration delay after the process begins is believed to cause the fish to miss the "biological window" of optimal physiological condition for the transition (Walters et al. 1978). The optimal thermal range for Chinook during smoltification and seaward migration is 50° F to 55° F (Rich 1997).

Chinook salmon spend between one and four years in the ocean before returning to their natal streams to spawn (Myers et al. 1998). Fisher (1994) reported that 87% of returning spring-run adults are three-years-old based on observations of adult Chinook trapped and examined at Red Bluff Diversion Dam between 1985 and 1991.

Central Valley Spring Run Chinook Salmon Critical Habitat. Critical habitat for Central Valley spring-run Chinook is designated to include all river reaches accessible to Chinook salmon in the Sacramento River and its tributaries in California. Also included are river reaches and estuarine areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. Excluded are areas above specific dams or above longstanding naturally impassable barriers.

All emigrating juvenile and yearling Central Valley spring-run Chinook use the lower reach of the Sacramento River and the Delta for rearing and as a migration corridor to the ocean. Some outmigrants utilize tidal and non-tidal freshwater marshes and other shallow water areas in the Delta as rearing areas for short periods prior to the final portion of their emigration to the sea. All adult spring-run Chinook salmon use the Delta and lower Sacramento River as upstream migration corridors to return to their natal streams for spawning.

A federal court vacated the rule designating critical habitat for this ESU. The analysis and conclusions regarding critical habitat remain informative for our application of the jeopardy standard even though they no longer have independent legal significance. In the event critical habitat should be redesignated before this action is fully implemented, the analysis will be relevant when determining whether a reinitiation of consultation would be necessary at that time. For these reasons and the need to timely issue this opinion, our critical habitat analysis remains.

Central Valley Steelhead. The Central Valley steelhead ESU was listed as threatened by NOAA Fisheries on March 19, 1998 (63 FR 13347). The ESU includes all naturally-produced steelhead (and their progeny) in the Sacramento-San Joaquin River Basin. NOAA Fisheries published a final 4(d) rule for this species on July 10, 2000 (65 FR 42422).

Central Valley steelhead once ranged throughout most of the tributaries and headwaters of the Sacramento and San Joaquin basins prior to dam construction, water development, and watershed perturbations of the 19th and 20th centuries (McEwan and Jackson 1996). Historical documentation exists that show steelhead were once widespread throughout the San Joaquin River system (CALFED 1999). In the early 1960s, the California Fish and Wildlife Plan estimated a total run size of about 40,000 adults for the entire Central Valley including San Francisco Bay (CDFG 1965). The annual run size for this ESU in 1991-92 was probably less than 10,000 fish based on dam counts, hatchery returns and past spawning surveys (McEwan and Jackson 1996).

Clark (1929) estimated that originally there were 6,000 miles of salmon habitat in the Central Valley system and that 80% of this habitat had been lost by 1928. Yoshiyama et al. (1996) calculated that roughly 2,000 miles of salmon habitat was actually available before dam construction and mining, and concluded that 82% of what was present is not accessible today. Clark (1929) did not give details about his calculation. Whether Clark's or Yoshiyama's calculation is used, only remnants of the former steelhead range remain accessible today in the Central Valley.

Impassable dams block access to most of the historical headwater spawning and rearing habitat of Central Valley steelhead. In addition, much of the remaining, accessible spawning and rearing habitat is severely degraded by elevated water temperatures, agricultural and municipal water diversions, unscreened and poorly screen water intakes, restricted and regulated streamflows, levee and bank stabilization, and poor quality and quantity of riparian and SRA cover. At present, wild steelhead stocks appear to be mostly confined to upper Sacramento River tributaries such as Antelope, Deer, and Mill creeks and the Yuba River (McEwan and Jackson 1996). Naturally spawning populations are also known to occur in Butte Creek, and the upper Sacramento, Feather, American, Mokelumne, and Stanislaus rivers (CALFED 1999). However, the presence of naturally spawning populations appears to correlate well with the presence of fisheries monitoring programs, and recent implementation of new monitoring efforts has found steelhead in streams previously thought not to contain populations, such as Auburn Ravine, Dry Creek, and the Stanislaus River. It is possible that other naturally spawning populations exist in Central Valley streams, but are undetected due to lack of monitoring or research programs (IEP Steelhead Project Work Team 1999).

All Central Valley steelhead are currently considered winter-run steelhead (McEwan and Jackson 1996), although there are indications that summer steelhead were present in the Sacramento River system prior to the commencement of large-scale dam construction in the 1940's (IEP Steelhead Project Work Team 1999). Adult Central Valley steelhead use the Delta and lower reaches of the Sacramento and San Joaquin Rivers as migration corridors to return to their

upstream spawning grounds. Adult steelhead migrate upstream in the Sacramento River mainstem from July through March, with peaks in September and February (Bailey 1954; Hallock et al. 1961). The timing of upstream migration is generally correlated with higher flow events, such as freshets or sand bar breaches, and associated lower water temperatures. The preferred temperatures for upstream migration are between 46°F and 52°F (Reiser and Bjornn 1979, Bovee 1978, Bell 1986). Unusual stream temperatures during upstream migration periods can alter or delay migration timing, accelerate or retard mutations, and increase fish susceptibility to diseases. The minimum water depth necessary for successful upstream passage is 18 cm (Thompson 1972). Velocities of 3-4 meters per second approach the upper swimming ability of steelhead and may retard upstream migration (Reiser and Bjornn 1979).

Spawning may begin as early as late December and can extend into April with peaks from January through March (Hallock et al. 1961). Unlike Chinook salmon, not all steelhead die after spawning. Some may return to the ocean and repeat the spawning cycle for two or three years; however, the percentage of repeat spawners is generally low (Busby et al. 1996). Steelhead spawn in cool, clear streams featuring suitable gravel size, depth, and current velocity.

Intermittent streams may be used for spawning (Barnhart 1986; Everest 1973). Gravels of 1.3 cm to 11.7 cm in diameter (Reiser and Bjornn 1979) and flows of approximately 40-90 cm/second (Smith 1973) are generally preferred by steelhead. Reiser and Bjornn (1979) reported that steelhead prefer a water depth of 24 cm or more for spawning. The survival of embryos is reduced when fines of less than 6.4 mm comprise 20 - 25% of the substrate. Studies have shown a survival of embryos improves when intragravel velocities exceed 20 cm/hour (Phillips and Campbell 1961, Coble 1961). The preferred temperatures for spawning are between 39° F and 52° F (McEwan and Jackson 1996).

Length of time required for eggs to develop and hatch is dependant on water temperature and is quite variable; hatching varies from about 19 days at an average temperature of 60°F to about 80 days at an average of 42°F. The optimum temperature range for steelhead egg incubation is 46°F to 52°F (Reiser and Bjornn 1979, Bovee 1978, Bell 1986, Leidy and Li 1987). Egg mortality may begin at temperatures above 56° F (McEwan and Jackson 1996).

After hatching, pre-emergent fry remain in the gravel living on yolk-sac reserves for another four to six weeks, but factors such as redd depth, gravel size, siltation, and temperature can speed or retard this time (Shapovalov and Taft 1954). Upon emergence, steelhead fry typically inhabit shallow water along perennial stream banks. Older fry establish territories which they defend. Streamside vegetation is essential for foraging, cover, and general habitat diversity. Steelhead juveniles are usually associated with the bottom of the stream. In winter, they become inactive and hide in available cover, including gravel or woody debris.

The majority of steelhead in their first year of life occupy riffles, although some larger fish inhabit pools or deeper runs. Juvenile steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. Water temperatures influence the growth rate, population density, swimming ability, ability to capture and metabolize

food, and ability to withstand disease of these rearing juveniles. Rearing steelhead juveniles prefer water temperatures of 45° F to 60° F (Reiser and Bjornn 1979, Bovee 1978, Bell 1986). Temperatures above 60° F have been determined to induce varying degrees of chronic stress and associated physiological responses in juvenile steelhead (Leidy and Li 1987).

After spending one to three years in freshwater, juvenile steelhead migrate downstream to the ocean. Most Central Valley steelhead migrate to the ocean after spending two years in freshwater (Hallock et al. 1961, Hallock 1989). All emigrating Central Valley steelhead use the lower reaches of the Sacramento River and the Delta for rearing and as migration corridor to the ocean. Some may utilize tidal marsh areas, non-tidal freshwater marshes, and other shallow water areas in the Delta as rearing areas for short periods prior to the final portion of their emigration to the sea. Barnhart (1986) reported that steelhead smolts in California range in size from 14 to 21 cm (fork length). In preparation for their entry into a saline environment, juvenile steelhead undergo physiological transformations known as smoltification that adapt them for their transition to salt water. These transformations include different swimming behavior and proficiency, lower swimming stamina, and increased buoyancy that also make the fish more likely to be passively transported by currents (Saunders 1965, Folmar and Dickhoff 1980, Smith 1982). In general, smoltification is timed to be completed as fish are near the fresh water to salt water transition.

Too long a migration delay after the process begins is believed to cause the fish to miss the "biological window" of optimal physiological condition for the transition (Walters et al. 1978). The optimal thermal range during smoltification and seaward migration for steelhead is 44° F to 52° F (Leidy and Li 1987, Rich 1997) and temperatures above 55.4° F have been observed to inhibit formation and decrease activity of gill (Na and K) ATPase activity in steelhead, with concomitant reductions in migratory behavior and seawater survival (Zaugg and Wagner 1973). Hallock et al. (1961) found that juvenile steelhead in the Sacramento Basin migrated downstream during most months of the year, but the peak period of emigration occurred in the spring, with a much smaller peak in the fall. Juvenile steelhead are typically present in the Delta in the spring months during emigration. Steelhead spend between one and four years in the ocean (usually one to two years in the Central Valley) before returning to their natal streams to spawn (Barnhart 1986, Busby et al. 1996).

Central Valley Steelhead Critical Habitat. Critical habitat was designated for the Central Valley steelhead ESU on February 16, 2000 (65 FR 7764). Critical habitat consists of the water, substrate, and adjacent riparian zone of accessible estuarine and riverine reaches. Accessible reaches are those within the historical range of the ESU that can still be occupied by any life stage of steelhead. Inaccessible reaches are those above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) and specific dams within the historical range of each ESU.

Critical habitat for Central Valley steelhead is designated to include all river reaches accessible to listed steelhead in the Sacramento and San Joaquin Rivers and their tributaries in California. Also included are river reaches and estuarine areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay,

Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. Excluded are areas of the San Joaquin River upstream of the Merced River confluence and areas above specific dams or above longstanding naturally impassable barriers.

A federal court vacated the rule designating critical habitat for this ESU. The analysis and conclusions regarding critical habitat remain informative for our application of the jeopardy standard even though they no longer have independent legal significance. In the event critical habitat should be redesignated before this action is fully implemented, the analysis will be relevant when determining whether a reinitiation of consultation would be necessary at that time. For these reasons and the need to timely issue this opinion, our critical habitat analysis remains.

IV. ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem within the action area.

A. Status of the Listed and Proposed Species and Critical Habitat in the Action Area

Sacramento River winter-run Chinook salmon. Historically, the Sacramento-San Joaquin Delta has been used by Sacramento River winter-run Chinook salmon as a migration route to and from cooler tributaries upstream used for spawning and rearing. Although historically found in both the San Joaquin and Sacramento River basins, present day spawning populations are only found in the Sacramento River Basin. Adult, fry and juvenile winter-run Chinook salmon may be found seasonally within the action area. February and March are critical months for juveniles in the Delta.

The action area is within the designated critical habitat of the Sacramento River winter-run Chinook salmon. Designated critical habitat within the action area ranges from riverine to estuarine areas. The essential elements of critical habitat within these areas are water, substrate, and adjacent riparian areas.

Central Valley spring-run Chinook salmon. All Central Valley spring-run Chinook salmon use the Sacramento-San Joaquin Delta as a migration corridor between the ocean and upstream tributaries which are used for spawning and rearing. Although both the Sacramento and the San Joaquin River basins were historically used for spawning, current spawning populations are primarily found in only the Sacramento River and its tributaries. Based on size classification and salvage records from the Central Valley Project (CVP) and State Water Project (SWP) fish facilities at the Delta pumps, juvenile spring-run Chinook could be found during the spring months within the action area. Some outmigrants utilize tidal and non-tidal freshwater marshes

and other shallow water areas in the Delta, such as those in the action area, as rearing areas for short periods prior to the final portion of their emigration to the sea.

The action area is located within the designated critical habitat of the Central Valley spring-run Chinook salmon. Designated critical habitat within the action area ranges from riverine to estuarine areas. The essential elements of critical habitat within these areas are water, substrate, and adjacent riparian areas.

Central Valley Steelhead. Historically, the Sacramento-San Joaquin Delta, including the south Delta, has been used by Central Valley steelhead as a migration corridor to and from upstream spawning and rearing areas. Adult and juvenile steelhead are found seasonally within the action area. Records from the CVP and SWP fish facilities show that the peak migration of steelhead through the Delta occurs between February and April, with some smolts present as early as September and as late as July (DWR 2000a).

The action area is located within the designated critical habitat of the Central Valley steelhead. Designated critical habitat within the action area ranges from riverine to estuarine areas. The essential elements of critical habitat within these areas are the water, substrate, and adjacent riparian areas.

B. Factors Affecting Species Environment within the Action Area

The essential features of salmonid habitat in the San Francisco Bay/Sacramento-San Joaquin River Delta estuary (Bay/Delta) and its tributaries include adequate (1) water quantity, quality, temperature, and depth; (2) cover/shelter; (3) food; (4) riparian vegetation; and (5) safe passage conditions. These features presently are adversely affected by human activities such as dredging and levee maintenance that continually occur. The degradation of the quantity and quality of these features has contributed to salmonid population declines significant enough to warrant the listing of several salmonid species in the Central Valley of California.

Historically, the Bay/Delta provided a highly productive rearing environment for outmigrating juvenile anadromous salmonids. Since the 1850's, wetland reclamation for urban and agricultural development caused the cumulative loss of 79 and 94 percent of the tidal marsh habitat in the Bay/Delta downstream and upstream of Chipps Island, respectively (Monroe and Kelly 1992; Goals Project 1999).

There are many current threats which affect the Delta aquatic ecosystems and the species that inhabit the area. These include: loss of habitat resulting from decreased freshwater inflows which increases salinity; loss of shallow water habitat from dredging, diking, and filling; pollution from various sources within the Delta; introduced aquatic species that have disrupted the food chain; entrainment at power plants, pumps, and other diversions; and altered patterns and timing of flows through the Delta resulting from state federal, and public water diversions.

Diverse fisheries habitat exists in the Delta near the power plants and enhancement sites, including freshwater and brackish marshes, shallow channel and shoal areas, and the main river channel. In some areas the nearshore areas are bordered by emergent vegetation. Much of the shallow water habitat in the area provides habitat for small crustaceans and amphipods which are important food resources for migrating juveniles.

Juvenile Chinook salmon migrate downstream from their upper river spawning and nursery grounds to lower river reaches and the Delta prior to entering the ocean as smolts. To a great extent, streamflow volume and runoff patterns regulate the quality and quantity of habitat available to juvenile salmonids. Salmonids are highly adapted to seasonal changes in flow. Increased stream flows in the fall and winter stimulate juvenile salmonid downstream migration, improve rearing habitat, and improve smolt survival to the ocean. Changes in runoff patterns from upstream reservoir storage to the Delta have adversely affected Central Valley salmonid populations through reduced survival of juvenile fish.

Recent habitat restoration initiatives sponsored and funded primarily by the CALFED Program have resulted in plans to restore ecological function to several thousands of acres of habitat within the Delta. During the past three years, approximately 1,500 acres of land have been purchased for restoration activities. Restoration of these areas primarily involves flooding lands previously used for agriculture, thereby creating additional rearing habitat for juvenile salmonids.

V. EFFECTS OF THE ACTION

Contra Costa Power Plant

Phase I Impacts

As discussed previously, during Phase I of Mirant's proposed conservation plan, an aquatic filter barrier will be placed at the CCPP to reduce entrainment and impingement of aquatic species. The placement of the AFB will directly affect 8 acres of habitat, 3.2 of which are shallow habitat less than 4 m deep, and which will no longer be available to salmonids for foraging or migration. Further, anchors and cables will hold the AFB in place. The anchors will cause temporary disturbance of the substrate and benthic communities. The anchors will permanently cover benthic areas estimated to be approximately 0.1 acres. This will likely result in the diminution of benthic organism productivity, however, based on the small size of the affected area relative to the undisturbed productive areas nearby, NOAA Fisheries expects that this loss of foraging habitat will be negligible as downstream migrating smolts also feed on mid-water organisms and juveniles are expected to find adequate food sources elsewhere in the area. Those benthic organisms in the interior of the AFB are likely to become available as they emerge into the water column and are taken up in the power plant circulating water system and are subsequently returned to the Delta. It is expected that downstream migrating smolts will transit around the AFB structure.

During the deployment of the AFB, boats will be used to install the curtain. This will cause an increase in the amount of engine and traffic noise in the area. Salmonids, both juvenile and adult will most likely avoid the area during the time boats are present. This effect will be temporary in nature and during a period when salmonids are least likely to be in the area. As a result, this impact is not expected to cause mortality or significant levels of injury to salmonids.

Once the AFB is in place and operating, there will be direct effects to fishes that may use this area of the Bay-Delta. The barrier could cause some modification of normal swimming patterns during migration by forcing smaller fish into deeper water to avoid the curtain and continue their downstream migration to the ocean. The potential for predation increases as the smaller fish enter deeper water where cover may not be available and larger fish are present. However, very little cover is currently available in this area of the Delta. Upstream migrating adult salmonids may also use low velocity eddies created around the downstream side of anchors as resting places. A second direct effect could be impingement on the AFB or entrainment of fish which get through or around the AFB in the power plant cooling structure. However, the AFB is expected to achieve very low approach velocities, on the order of 0.02 feet/second. This should substantially reduce impingement of salmonids. Further, effective screen size of the AFB will be very small, on the order of 3/32 inches. This screening effectiveness exceeds the current screening capabilities at the power plants. Based on the results of past studies at the CCPP, the current screens result in the death of no more than 15 juvenile winter-run Chinook salmon, 200 juvenile spring-run Chinook salmon and zero steelhead annually.

Monitoring will be conducted to determine the effectiveness of the AFB between the months of February and July while the largest number of juvenile salmonids will be migrating through the Delta. Sampling will be done on the outside and the inside of the AFB. The proposed program is designed to determine the percentage of exclusion achieved by the AFB. Listed species may be captured, identified, counted, and subsequently released. Some general impacts to the listed species caused by this type of sampling are: 1) physiological stress and disorientation resulting from capture and handling; 2) physical damage which may reduce survival for captured juveniles, through increased disease susceptibility or severe injury; and, 3) mortality.

Phase II Impacts

If the AFB is found to be effective during Phase I at the CCPP, no changes will be made to its operation. If, however, the AFB is not achieving the expected and acceptable exclusion rates, a Variable Speed Drive (VSD) program will be implemented. While the power plant is being operated in VSD mode, the potential for impacting aquatic organisms through entrainment and impingement exists. Entrainment effects occur on those fish that pass through or around fish screens and enter the circulating water systems in the power plant. Impingement generally occurs when fish, typically smaller, weaker individuals, are held against the intake screens.

Entrainment usually occurs when organisms are unable to avoid the intake screens and are captured and passed through the circulating water system. The organisms involved are small, capable of passing through the 3/8 mesh of the current fish screens, and include eggs, larvae, and

early juvenile stages of various fish species. As the organisms pass through the system they are exposed to several types of stresses, including, mechanical, pressure, thermal, and chemical. Often, the organisms do not survive entrainment.

Impingement occurs when an organism passes through the bar racks and becomes trapped against the fish screens which also remove debris from the circulating water systems. At the CCPP, fish which are susceptible to impingement are often small juveniles or larger juveniles in a weakened state. Impinged fish generally do not survive.

Based on studies that were conducted in 1978-1980 for impingement and 1986-1992 for entrainment at the CCPP, the take of sensitive aquatic species will be reduced during the use of the VSD program. Some fish may become impinged on the screens resulting in mortality. Other fishes, primarily larval and small juveniles, may pass through the screens and become entrained in the power plant cooling system, which will also result in mortality. The studies indicate that annually the take, consisting of juvenile salmonids, will be up to 15 winter-run Chinook salmon, 200 spring-run Chinook salmon, and zero steelhead due to impingement and entrainment.

Other Impacts associated with CCPP Maintenance and Repair

In addition, it is possible that maintenance and repair activity at the CCPP could result in some take of salmonids. As noted above, these activities may include maintenance and repair of power plant facilities, including, but not limited to, all related building, structures (including intake, AFB panel replacement and repair, AFB replacement as necessary, resetting or moving anchors and other maintenance and repair necessary to operate the AFB) shoreline maintenance, and intake forebay dredging. Although difficult to predict, annual take from these activities is not expected to be more than 5 winter-run Chinook salmon, 60 spring-run Chinook salmon and 5 steelhead.

Pittsburg Power Plant

Phase I Impacts

While the AFB is being evaluated during Phase I at the CCPP, the VSD mode will be in use at the PPP. The effects of VSD use at the PPP will be similar to those described above for the CCPP. While the power plant is being operated in VSD mode, the potential for impacting aquatic organisms through entrainment and impingement will continue, but at a level reduced from baseline flows. Because juvenile salmonids that could enter the cooling water structure much larger than the 3/8" mesh of the fish screens, they are unlikely to be entrained. Juvenile salmonids that are impinged are likely to suffer a high rate of mortality. Generally, most larval and juvenile fishes which are impinged or entrained are expected to die and will be lost to the overall population. Based on the results of PG&E's entrainment studies in 1978-1979 and also during striped bass monitoring conducted during 1986-1992 and impingement studies in 1978-1979 (Ecological Analysts, Inc. 1981a), this number is expected to be no more than 350 winter-run Chinook salmon, 500 spring-run Chinook salmon, and zero steelhead annually. As with the

take at the CCPP, the take at PPP will consist of juveniles (i.e. impingement), as no adults are expected to be taken during these operations.

During Phase I and the early portions of Phase II, dredging will be conducted at the PPP to remove silt and other debris from the intake canals. The dredging at the PPP site will be done mechanically with a clam shell dredge. Impacts associated with this type of sediment removal include salmonid behavioral modification (primarily avoidance tactics) due to increased turbidity, redistribution or release of contaminants, removal of benthic food sources, and removal of established vegetative cover.

Turbidity associated with dredging may interfere with foraging, migratory behavior and it may increase the risk for predation of anadromous salmonids. Impacts from the turbidity are expected to be minor and temporary in nature. Fish in the area at the time of dredging, are expected to avoid the area of high turbidity and return once turbidity dissipates.

During dredging activities contaminants in the sediment may be exposed and mixed in the water column. These contaminated sediments could have detrimental physiological effects on the salmon as they migrate through the Bay/Delta. Because the fish use this area primarily as a migratory corridor, they will be in the area for only a short while and therefore are not expected to be exposed to any toxins long enough to accumulate in body tissues or have a lasting negative physiological effect on these individuals.

Benthic organisms are an important food source for salmon within this portion of the migratory corridor. Through dredging, some of these organisms will be lost. However, once dredging is completed, benthic organisms will recolonize the dredged area. Further, benthic organisms near the intake structures are not easily available to downstream migrating smolts or juvenile salmon. Moreover, adjacent areas will remain available to juvenile salmonids for foraging. Mirant's conservation program calls for creation of off-channel habitat that would be available to juvenile fishes. Therefore, this impact to the prey base that migrating salmonids depend upon will be limited in scope and duration and juvenile salmonids are not likely to be adversely affected.

Phase II Impacts

If the AFB is found to be operating effectively at CCPP and it sufficiently reduces the amount of take at that power plant, a similar, but much larger, structure will be placed at the PPP to reduce the effects of entrainment and impingement on aquatic species. Effects to the fish due to the AFB will be generally the same as those at CCPP. Due to the larger size of the barrier at PPP, the effects could be larger or more pronounced. However, it is possible that units 1-5 at the PPP could be retired by the time that the AFB is ready for deployment and operation at the PPP. If this happens, the AFB would be redesigned and would be approximately the same size as the AFB at the CCPP.

The placement of the AFB, as currently proposed, would directly affect 28 acres of habitat, 19 of which are shallow water habitat less than 4 m deep. The area inside the AFB will no longer be

available to salmonids for foraging and resting habitat due to the placement of the curtain. However, benthic organisms that emerge and enter the water column would likely enter the water cooling system and be expelled in the cooling discharge where they would be available to foraging organisms. The AFB anchors may create low-velocity eddies that upstream migrating salmon may use for resting. The deployment of the AFB will also cause temporary noise disturbance in the immediate area. Placement of anchors, which will hold the AFB in place, will cause temporary disturbance of the substrate and benthic community.

Fish will also be directly affected by the AFB. The barrier could cause some modification of normal swimming patterns by forcing smaller fish into deeper water to avoid the barrier and swim around to continue their migration. The potential for predation increases as the smaller fish enter deeper water where cover may not be as available and larger predatory fish are present. As with the AFB at the CCPP, the possibility of impingement and entrainment exists while the AFB is operating. In both cases, NOAA Fisheries expects that the entrained or impinged fish will be killed. Based on the expected effectiveness of the AFB, 80 to 99 percent of the individual salmonids passing the barrier will be unharmed. This screening effectiveness exceeds the current screen capabilities. Based on the results of past studies at the PPP, the current screen effectiveness would be expected to result in the death of no more than 350 juvenile winter-run Chinook salmon, 500 juvenile spring-run Chinook salmon, and zero steelhead annually. A properly functioning AFB should result in the death of far less than these levels of juvenile salmonids. However, if the AFB is damaged or does not have a tight seal with the bottom of the river, many more fish may bypass the AFB and become trapped within the AFB structure, entrained in the cooling water intake system, or impinged on the existing rotating screens at the power plant.

Monitoring will be conducted to determine the effectiveness of the AFB between the months of February and July while the largest number of juveniles will be migrating through the Delta. Sampling will be done on the outside and the inside of the AFB. The program will be designed to determine the percentage of exclusion achieved by the AFB at PPP. Listed species may be captured, identified, counted, and subsequently released. Some general impacts to the listed species caused by this type of sampling are: 1) physiological stress and disorientation resulting from capture and handling; 2) physical damage which may reduce survival for captured juveniles, through increased disease susceptibility or severe injury; and, 3) mortality.

Other Impacts associated with PPP Maintenance and Repair

In addition, it is possible that maintenance and repair activity at the PPP could result in some take of salmonids. As noted above, these activities may include, among other activities, maintenance and repair of power plant facilities, including, but not limited to, all related buildings, structures (including intake, AFB panel replacement and repair, AFB replacement as necessary, resetting or moving anchors and other maintenance and repair necessary to operate the AFB), shoreline maintenance, other screening systems, and intake forebay dredging. Although difficult to predict, annual take from these activities is not expected to be more than 100 winter-run Chinook salmon and 5 steelhead.

Montezuma Enhancement Site

Habitat Enhancement Impacts

The use of heavy equipment to create the dead-end sloughs and tidal inlets will result in the temporary and permanent disturbance of sensitive species habitat. Construction activities which will occur in Delta waters, e.g. levee removal, shall be limited to minimize impacts to Chinook salmon and steelhead. For aquatic species, the use of the existing aquatic habitat on the site is unknown but is expected to be limited by the size of the existing culvert structures and by the poor quality of the existing habitat. The draft HCP assumes that the existing aquatic habitat on site is essentially unavailable to the targeted sensitive fish species. However, surveys for sensitive species shall be conducted prior to implementing the habitat enhancement measures to confirm their absence. These surveys may result in the capture of anadromous species which could cause additional stress, injury, or mortality to the captured individuals. If sensitive fish species are found during these pre-construction surveys, a more extended effort will be conducted to remove and relocate individuals to aquatic habitats adjacent to the site.

Chinook salmon juveniles , and other native Delta fisheries, should benefit from the creation and enhancement of 56 acres of shallow water habitat. These areas can be used by emigrating salmonids as rearing and resting places. They may provide calmer backwater areas for shelter during winter high flow periods. It is difficult to ascertain the expected benefits salmonid populations may experience as a result of the creation of additional rearing habitat. The habitat may increase the survival of the proportion of any juvenile cohort that utilizes the site if the conditions are acceptable for native Delta fisheries. A monitoring and remediation program to evaluate habitat variables such as temperature and dissolved oxygen is included in Mirant's conservation program to ensure that habitat conditions remain acceptable to these native fisheries at the enhancement site.

The Montezuma Enhancement Site activity is not expected to adversely affect designated or proposed critical habitat and should benefit designated critical habitat. The site is located adjacent to the confluence of the Sacramento and San Joaquin Rivers and is not included within the descriptions of designated critical habitat.

Impacts on ESU Survival and Potential for Recovery and Critical Habitat

Salmonids are expected to be in the action areas of this project throughout much of the year both as juveniles and adults. Salmonids will be present in the largest numbers during adult immigration to spawning grounds and during emigration of the juveniles. Adults predominately use the Delta as a migration corridor in the months of December through July with the highest numbers being present during February and March. Juveniles are in the Delta from January through June with the peak of their emigration being from January to April.

Although adults are expected to be in the action area periodically throughout the duration of the time period analyzed in this Opinion, no take of adults is expected to occur due to Corps permit

activities or associated conservation program actions. Adults are capable of avoiding the actions which may have negative impacts to their survival, including, dredging, impingement and entrainment during operation of the AFB and also during operation of the plants in VSD mode.

During operation of the AFB and the operation of the power plants in VSD mode over the term of the permits, take of juvenile salmonids is expected to occur. This take may consist of impingement on the AFB or existing fish screens which are in place and/or entrainment in the power plants cooling structures. Both impacts are expected to result in mortality of all affected individuals. If the AFB performs as expected, the mortality will be significantly less with the AFB than with the VSD. Although mortality will occur, the expected annual levels are not expected to affect the species' likelihoods of survival and recovery. Annual mortality at the CCPP is not expected to exceed 15 juvenile winter-run Chinook, 200 juvenile spring-run Chinook, and zero steelhead. Annual mortality at the PPP is not expected to exceed 350 juvenile winter-run Chinook, 500 juvenile spring-run Chinook, and zero steelhead. At both plants, mortality is expected to be significantly less than these values when a properly functioning AFB is in place.

Phase I and early Phase II impacts will also include the effects of dredging at PPP. Impacts associated with dredging of the type to be conducted at PPP include behavioral modification due to increased turbidity, potential release of contaminants, removal of benthic food sources, and removal of established vegetative cover. All of these effects will likely cause any fish present to avoid the area of turbidity and go elsewhere to find additional sources of food and cover. Because this work is expected to be temporary and completed during a window between June 1 and October 31, any potential effects to salmonids populations are expected to be minimized and are not expected to result in a reduction in feeding, growth, or survival rates of individuals in the populations.

NOAA Fisheries expects minimal take of salmonids during effectiveness monitoring at the plants, primarily because past studies have resulted in low levels of capture at these sites. Fish which are captured may suffer some deleterious effects from the monitoring program. These effects could include, physiological stress from capture and handling, physical damage which may result in disease or death, and mortality. During sampling, great care will be taken to ensure that fish are protected from harm to the maximum extent practicable. Although salmonids will be captured, NOAA Fisheries expects that injury and mortality levels resulting from capture and handling will be a fraction of the overall catch – no more than 10 percent.

Construction at the Montezuma Enhancement Site is not expected to have any adverse effects on listed salmonid populations. The site is currently isolated from the main channel and the fish do not have easy access to the site. Monitoring, including fish sampling, will be conducted to determine the presence or absence of sensitive species in the area prior to construction. NOAA Fisheries expects the monitoring to capture negligible numbers of salmonids. Chinook salmon juveniles , and other native Delta fisheries, should benefit from the creation of 56 acres of shallow water habitat which can be used by emigrating salmonids as rearing and resting places. The new habitat may increase the survival of the proportion of any juvenile cohort that utilizes

the site if the conditions are acceptable for native Delta fishes. A monitoring and remediation program to evaluate habitat variables such as temperature and dissolved oxygen is included in Mirant's conservation program to ensure that habitat conditions remain acceptable to native fishes at the enhancement site.

Critical habitat for winter-run Chinook salmon, spring-run Chinook salmon, and Central Valley steelhead is designated within the action area for this project. Installation of the AFB at CCPP will remove 8 surface acres of habitat from the Delta. If the AFB is successful at CCPP, another AFB will be installed at the PPP which will, as currently proposed, enclose 28 acres of habitat. Considering the size of the Delta and critical habitat availability in and around the action area, NOAA Fisheries believes that this loss of habitat will not diminish the capability of critical habitat to support survival and recovery of the listed salmonids which periodically use this area. In addition, 56 acres of foraging and resting habitat will be created and enhanced at the Montezuma Enhancement Site and made accessible to salmonids as a portion of this project. This newly created habitat may be used by the species during the juvenile emigration, supporting the survival and recovery of the affected populations.

VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

Non-Federal actions that may affect the action area include State angling regulation changes, voluntary State or private sponsored habitat restoration activities, agricultural practices, increased population growth, mining activities, and urbanization. State angling regulations are generally moving towards greater restrictions on sport fishing to protect listed fish species. Habitat restoration projects may have short-term negative effects associated with in-water construction work, but these effects are temporary, localized, and the outcome is a benefit to these listed species. Farming activities within or adjacent to the action area may have negative effects on water quality due to runoff containing agricultural chemicals. Future urban development and mining operations in the action area may adversely affect water quality, riparian function, and stream productivity.

VII. CONCLUSION

Based on the best available scientific and commercial information, the current status of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead, the environmental baseline for the action area, the effects of the Project and the cumulative effects, it is NOAA Fisheries' biological opinion that the issuance of Corps 5-year permits to Mirant Delta, LLC for installation of AFBs at the CCPP and PPP and dredging at the PPP is not likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley Steelhead, nor result in the destruction or adverse modification of their critical habitats.

VIII. INCIDENTAL TAKE STATEMENT

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the proposed action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the Incidental Take Statement.

The measures described below are nondiscretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant he document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps or the applicant must report the progress of the action and its impact on the species to NOAA Fisheries as specified in the incidental take statement (50 CFR §402.14(i)(3)).

A. Amount or Extent of Take

NOAA Fisheries anticipates that the issuance of the Corps permits for installation of the AFB at the CCPP and PPP and dredging at the PPP along with the associated operation, maintenance, and repair of the CCPP and PPP under the proposed conservation plan over the next 5 years will result in the incidental take of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley Steelhead due to placement and operations of aquatic filter barriers, VSD operation, maintenance activities, including dredging, enhancement measures, maintenance, and repair. The incidental take is expected to be in the form of death, injury, harassment, harm, capture, and collection and could impact juveniles. No take of adults is anticipated Take is expected to include the following:

Contra Costa Power Plant

Phase I

- All individuals harmed, harassed, or killed from placement of the AFB anchors, curtain, and boom. Approximately 90 concrete anchors (7'x7'x4') will be placed on the bottom. The curtain will cover a length of 1700' and is about fifteen feet wide where it rests on the bottom of the river.

- Approximately 8 surface acres of water, including about 3.2 acres of shallow water habitat less than 4 meters deep, will be lost. This will result in the loss of foraging habitat which is used by juveniles during emigration. This could result in mortality of some juveniles because of malnutrition. Other juveniles may be taken by harassment; being forced to travel to other areas to find sources of foraging habitat.

- All individuals collected, harmed, harassed, or killed during monitoring activities. Incidental mortality of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley Steelhead combined is not expected to exceed 10 percent of the number of individuals collected.

- Twenty percent of the total number of individuals expected to pass by the AFB killed, through impingement on the AFB and entrainment in the CCPP combined, during operation of the AFB. The specific number will be determined during the monitoring studies which will be conducted by Mirant.

Phase II -

During Phase II if the AFB is found to reduce entrainment and impingement of salmonids at the CCPP, the CCPP will continue to operate as it did in Phase I and take will remain the same. If the AFB does not significantly reduce take and the VSD program is implemented, the following take is expected to occur:

- All individuals killed by entrainment in the cooling structures or impingement on the intake screens. Based on the results of PG&E's entrainment studies in 1978-1979 and also during striped bass monitoring conducted during 1986-1992 and impingement studies in 1978-1979 (Ecological Analysts, Inc. 1981a), this number is expected to be no more than 15 juvenile winter-run Chinook salmon, 200 juvenile spring-run Chinook salmon, and zero steelhead annually.

Maintenance and Repair Activities

- All individuals harmed, harassed, or killed during maintenance and repair activity at the CCPP. This number is not expected to be more than 5 winter-run Chinook salmon and 5 steelhead.

Pittsburg Power Plant

Phase I

- All individuals killed by entrainment in the cooling structures or impingement on the intake screens. Based on the results of PG&E's entrainment studies in 1978-1979 and also during striped bass monitoring conducted during 1986-1992 and impingement studies in 1978-1979 (Ecological Analysts, Inc. 1981a), this number is expected to be no

more than 350 juvenile winter-run Chinook salmon, 500 juvenile spring-run Chinook salmon, and zero steelhead annually.

Phase II

- All individuals harmed, harassed, or killed from placement of the AFB anchors, curtain, and boom. Approximately 142 concrete anchors (7'x7'x4') will be placed on the bottom. The curtain will cover a length of 3,200' and is about fifteen feet wide where it rests on the bottom.

- Approximately 28 surface acres of water, including about 14 acres of shallow water habitat less than 4 meters deep, will be lost. It will encompass 2,300' of shoreline. This will result in the loss of foraging habitat which is used by juveniles during emigration.

- All individuals collected, harmed, harassed, or killed during monitoring activities. Incidental mortality of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley Steelhead combined is not expected to exceed 10 percent of the number of individuals collected.

- Twenty percent of the total number of individuals expected to pass by the AFB killed, through impingement and entrainment combined, during the operation of the AFB. This number will be determined during the monitoring studies which will be conducted by Mirant.

Maintenance and Repair Activities

- All individuals harmed, harassed, or killed during maintenance and repair activity at the PPP. This number is not expected to be more than 100 winter-run Chinook salmon, 150 spring-run Chinook salmon, and 5 steelhead.

Montezuma Enhancement Site

- All individuals taken during construction of the enhancement site. Take may be temporary disturbance by noise or mortality caused directly and indirectly from construction. All take will be limited to the construction window.

- All individuals collected, harmed, harassed, or killed during pre-construction survey activities. Incidental mortality of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley Steelhead combined is not expected to exceed 10 percent of the number of individuals collected.

B. Effect of Take

The effect of this action will consist of fish behavior modification, temporary disorientation, and potential death or injury to juvenile Sacramento River winter-run Chinook salmon, Central

Valley spring-run Chinook salmon, and Central Valley steelhead due to the entrainment, impingement, capture, and handling of fish during power plant monitoring, operations, repair and maintenance of the PPP and CCPP and construction and related activity at the enhancement site construction.

In the accompanying biological opinion, NOAA Fisheries determined that this level of anticipated take is not likely to result in jeopardy to the listed species.

C. Reasonable and Prudent Measures

NOAA Fisheries believes the following reasonable and prudent measures are necessary and appropriate to minimize the incidental take of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead caused by the proposed project:

Contra Costa Power Plant

1. The Corps shall ensure that impacts resulting from project construction and operation of the AFB are minimized. The maximum reduction in impingement and entrainment-related fish mortality shall be achieved.

2. The Corps shall ensure that impacts resulting from fish monitoring are minimized, and that fish monitoring yields significant information about project performance.

3. The Corps shall ensure that all monitoring protocols, including species handling and reporting requirements, are designed in coordination with NOAA Fisheries.

Pittsburg Power Plant

1. The Corps shall ensure that during VSD mode all fish screens shall be operated to achieve maximum reduction in impingement-related mortality.

2. The Corps shall ensure that fish monitoring is conducted at PPP, that impacts resulting from fish monitoring are minimized, and that fish monitoring yields significant information about the VSD performance and take of sensitive species.

3. The Corps shall ensure that impacts resulting from dredging at the PPP are minimized.

4. Placement of aquatic filter barrier at PPP will be dependent upon successful deployment and operation of a similar structure at the CCPP.

Montezuma Enhancement Site

1. The Corps shall ensure that the Enhancement Site goals outlined in the conservation plan are achieved.

2. The Corps shall ensure that impacts resulting from the construction and monitoring activities at the enhancement site are minimized.

3. The Corps shall ensure that the Enhancement Site construction begins within three years of the issuance of this Biological Opinion.

D. Terms and Conditions

The Corps is responsible for compliance with the following non-discretionary terms and conditions that implement the reasonable and prudent measures described above. These terms and conditions are intended to minimize incidental take of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead,

Contra Costa Power Plant

1. The Corps shall ensure that impacts resulting from project construction and operation of the AFB are minimized:

a. Anchor placement at or below the water surface or other in-water construction activities, including deployment of the AFB curtain shall occur between June 1 and October 31 to minimize the effects on listed fish species.

b. Best management practices shall be employed during construction activities or operation of the AFB to avoid and minimize vegetation removal, erosion, or siltation. Anchors must be composed of plastic, concrete, or steel, and be free of coatings or treatments that may leach into the surrounding environment and adversely affect listed species.

c. The Corps should observe the protocol for study plans, research, and analysis of study results contained in NOAA Fisheries policy guidance: Experimental Fish Guidance Devices (Attachment 1).

d. The Corps must coordinate all AFB activities with NOAA Fisheries-SWR Engineering Team Leader: Rick Wantuck
NOAA Fisheries Santa Rosa Area Office
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404-6515
Phone: (707)575-6063

e. A Service-approved monitoring program shall be implemented on a regular basis to insure that the AFB is in good operating condition at all times; sealed on bottom, no rips or tears, etc. The plan shall be approved before deployment of the AFB. The AFB will be monitored for the life of the program at a minimum of once every six months.

f. Monitoring reports shall be sent to NOAA Fisheries at the conclusion of each monitoring session to verify that the AFB has been checked and is functioning properly.

e. If NOAA Fisheries, the USFWS, and CDFG determine the AFB is not successful, the VSD shall be implemented as an interim backup measure. Mirant shall then reinitiate consultation with NOAA Fisheries to develop measures to further protect the listed salmonids.

2. The Corps shall ensure that impacts resulting from fish monitoring are minimized, and that monitoring yields significant information about project performance.

a. A prototype evaluation program shall be submitted to NOAA Fisheries complete with activity descriptions, schedule, and anticipated milestones prior to beginning the AFB placement.

b. The project proponent must report on-going activities, and results of experimentation and evaluation to NOAA Fisheries and the Central Valley Fish Facilities Review Team.

c. Identification of listed rearing and outmigrating salmonids shall be based on NOAA Fisheries-approved size criteria.

d. Any adult Chinook salmon or steelhead captured during fish monitoring activities shall be released immediately without further handling. Such take shall be recorded and reported immediately. Adult take would exceed the anticipated incidental take of the species and would require the immediate reinitiation of consultation.

e. Captured salmonids shall be handled with extreme care and kept in cool local water to the maximum extent possible during sampling and processing procedures. They shall be held in a container separate from other fish, anesthetized prior to out-of-water handling using a buffered solution of tricaine (Summerfelt and Smith 1990), and allowed to recover from the effects of the anesthetic prior to release. Elapsed time from capture to release will be minimized. Release will occur in or near aquatic vegetation or other protective cover.

f. A qualified, NOAA Fisheries approved, fisheries biologist shall be present for and supervise all monitoring activities.

g. A fish and habitat monitoring program designed to assess salmonid relative abundance and take from stranding and predation, shall be implemented as described in Appendix H of the Draft HCP. Monitoring results will be reported via telephone or e-mail to NOAA Fisheries every six months during the three year sampling period, and in an annual report due January 31 of the following year. Information will be used to guide necessary or desirable modification to the AFB to improve conditions for listed species. Reports shall be submitted to:

Supervisor, Protected Resources Division
National Marine Fisheries Service
Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814-4706

3. The Corps shall ensure that all monitoring protocols, including species handling and reporting requirements, are designed in coordination with NOAA Fisheries.

a. All monitoring protocols, plans, and reports shall be sent to NOAA Fisheries for approval prior to finalization and initiation .

b. All take will be monitored and recorded during operation of the AFB. Annual reports shall be submitted to:

Supervisor, Protected Resources Division
National Marine Fisheries Service
Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814-4706

Pittsburg Power Plant

1. The Corps shall ensure that during VSD mode all fish screens shall be operated to achieve maximum reduction in impingement-related mortality.

a. Fish screens at the power plant shall be rotated at least once every four hours during plant operation.

2. The Corps shall ensure that fish monitoring is conducted at PPP, that impacts resulting from fish monitoring are minimized, and that fish monitoring yields significant information about the VSD performance and take of sensitive species.

a. A prototype evaluation program shall be submitted to NOAA Fisheries complete with activity descriptions, schedule, and anticipated milestones

b. Identification of listed rearing and outmigrating salmonids shall be based on NOAA Fisheries-approved size criteria.

c. Any adult Chinook salmon or steelhead captured during fish monitoring activities shall be released immediately without further handling. Such take shall be recorded and reported. Adult take would exceed the anticipated incidental take of the species and would require the immediate reinitiation of consultation.

d. Captured salmonids shall be handled with extreme care and kept in cool local water to the maximum extent possible during sampling and processing procedures. They shall be held in a container separate from other fish, anesthetized prior to out-of-water handling using a buffered solution of tricaine (Summerfelt and Smith 1990), and allowed to recover from the effects of the anesthetic prior to release. Elapsed time from capture to release will be minimized. Release will occur in or near vegetation or other protective cover.

e. A qualified, NOAA Fisheries approved, fisheries biologist shall be present for and supervise all monitoring activities.

f. All take will be monitored and recorded during operation of the AFB. Annual reports shall be submitted by January 31 of the following year to:

Supervisor, Protected Resources Division
National Marine Fisheries Service
Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814-4706

3. The Corps shall ensure that impacts resulting from dredging at the PPP are minimized.

a. All dredging will be conducted shall occur between June 1 and October 31 to minimize the effects on listed fish species.

4. Placement of aquatic filter barrier at PPP will be dependent upon successful deployment and operation of a similar structure at the CCPP.

a. Monitoring will be conducted and evaluated for a period of three years at CCPP before determining applicability at the PPP.

b. Monitoring results will be evaluated by a team of Service, CDFG, and Corps biologists to determine if they are sufficient to deem AFB placement at PPP appropriate. The final decision on the placement of an AFB at PPP will be made by the USFWS, NOAA Fisheries, and CDFG.

b. If NOAA Fisheries, the USFWS, and CDFG determine the AFB is not successful at the CCPP, one shall not be placed at the PPP and Mirant must reinitiate consultation to evaluate further measures to reduce the take of salmonids due to operating in VSD mode.

Montezuma Enhancement Site

1. The Corps shall ensure that impacts resulting from the construction and monitoring activities at the enhancement site are minimized and that enhancement site goals are achieved.

a. Best management practices shall be employed during construction activities to avoid and minimize vegetation removal, erosion, or siltation.

b. All construction and monitoring plans will be developed and reviewed in consultation with the USFWS, NOAA Fisheries,, CDFG, and the permittee.

c. A qualified fishery biologist shall be present for and supervise all monitoring activities.

d. All in-water construction at the enhancement site shall be conducted during the period of July through August to minimize potential take of juveniles.

2. The Corps shall ensure that the Enhancement Site construction is completed within three years of the issuance of this Biological Opinion.

a. A design team shall be established within six months of the issuance of the biological opinions.

b. Within one year of the issuance of the biological opinions a design for the enhancement site shall be submitted to the USFWS, NOAA Fisheries, and CDFG for review.

c. Annual reports shall be submitted to NOAA Fisheries to describe the progress of the project and expected milestones. Reports shall be submitted to:

Supervisor, Protected Resources Division
National Marine Fisheries Service
Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814-4706

IX. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on a listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Corps should support expanded anadromous salmonid monitoring programs throughout the Sacramento-San Joaquin Delta to improve our understanding of the occurrence, distribution, and life history of listed species.

2. The Corps should support and promote aquatic and riparian habitat restoration within the Sacramento-San Joaquin Delta with special emphasis upon the protection and restoration of shallow water habitat.

In order for NOAA Fisheries to be kept informed of actions minimizing or avoiding adverse effects of benefitting listed species or their habitats, NOAA Fisheries requests notification of the implementation of any conservation recommendations.

X. REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the proposed Army Corps of Engineers permit applications for the CCPP and the PPP. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of anticipated incidental take is exceeded, formal consultation shall be reinitiated immediately.

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Attachment 1

EXPERIMENTAL FISH GUIDANCE DEVICES

Position Statement of
National Marine Fisheries Service
Southwest Region

January 1994

NMFS Southwest Region Position Paper on Experimental Technology
for Managing Downstream Salmonid Passage

INTRODUCTION

Numerous stocks of salmon and steelhead trout in California streams are at low levels and many stocks continue to decline. The Sacramento River winter-run Chinook salmon is listed as "endangered" under the Federal Endangered Species Act. Petitions for additional listings are pending. It is essential to provide maximum protection for juveniles to halt and reverse these declines.

The injury or death of juvenile fish at water diversion intakes have long been identified as a major source of fish mortality [Spencer 1928, Hatton 1939, Hallock and Woert 1959, Hallock 1987]. Fish diverted into power turbines experience up to 40 percent mortality as well as injury, disorientation, and delay of migration [Bell, 1991], while those entrained into agricultural and municipal water diversions experience 100 percent mortality. Diversion mortality is the major cause of decline in some fish populations.

Positive barrier screens have long been tested and used to prevent or reduce the loss of fish. Recent decades have seen an increase in the use and effectiveness of these screens and bypass systems; they take advantage of carefully designed hydraulic conditions and known fish behavior. These positive systems are successful at moving juvenile salmonids past intakes with a minimum of delay, loss or injury.

The past few decades have also seen much effort in developing "startle" systems to elicit a taxis (response) by the fish with an ultimate goal of reducing entrainment. This Position Statement addresses research designed to prevent fish losses at diversions and presents a tiered process for studying, reviewing, and implementing future fish protection measures.

JUVENILES AT INTAKES

The three main causes of delay, injury, and loss of fish at water intakes are entrainment, impingement, and predation. Entrainment occurs when the fish is pulled into the diversion and passes into a canal or turbine. Impingement is where a fish comes in contact with a screen, a trashrack, or debris at the intake. This causes bruising, descaling, and other injuries. Impingement, if prolonged, repeated, or occurs at high velocities also causes direct mortality. Predation also occurs. Intakes increase predation by stressing or disorienting fish and/or by providing habitat for fish and bird predators.

A. Positive Barriers

Positive barrier screen systems and criteria for their design have been developed, tested, and proved to minimize harm caused at diversions. Positive barriers do not rely on active fish behavior; they prevent physical entrainment with a physical barrier. Screens with small openings and good seals are designed to work with hydraulic conditions at the site, providing low velocities normal to the screen face and sufficient sweeping velocities to move fish past the screen. These screens are very effective at preventing entrainment [Pearce and Lee 1991]. Carefully designed bypass systems minimize fish exposure to screens and provide hydraulic

conditions that return fish to the river, preventing both entrainment and impingement [Rainey 1985]. The positive screen and fish bypass systems are designed to minimize predation, and to reduce mortality, stress, and delay from the point of diversion, through the bypass facility, and back the river.

Carefully designed positive barrier screen and bypass systems have been installed and evaluated at numerous facilities [Abernethy et al 1989, 1990, Rainey, 1990, Johnson, 1988]. A variety of screen types (e.g. flat plate, chevron, drum) and screen materials (e.g. woven cloth, perforated plate, profile wire), have proved effective, taking into consideration their appropriateness for each site. Well-designed facilities consistently result in a guidance efficiency of over 95 percent [Hosey, 1990, Neitzel, 1985, 1986, 1990 a,b,c,d, Neitzel, 1991].

The main drawback to positive barrier screens is cost. At diversions of several hundred cubic feet per second or greater, the low velocity requirement and structural complexity can drive the cost for fish protection and the associated civil works over a million dollars. At the headwork, the need to clean the screen, remove trash, and provide regular maintenance (e.g. seasonal installation, replacing seals, etc.) also increase costs.

B. Behavioral Devices

Due to higher costs of positive barrier screens, there has been much experimentation since 1960 to develop behavioral devices as a substitute for barrier screens [EPRI, 1986]. A behavioral device, as opposed to a positive (physical) barrier, requires a volitional taxis on the part of the fish to avoid entrainment. Early efforts were designed to either attract or repel fish. These studies focused on soliciting a behavioral response from the fish, usually noticeable agitation. Using these startle investigations to develop effective fish guidance systems has not been effective.

Experiments show that there is a large response variation between individual fish of the same size and species. Therefore, it cannot be predicted that a fish will always move toward or away from a certain stimulus. Even when such a movement is desired by a fish, it often cannot discern the source or direction of the signal and choose a safe escape route.

Many behavioral devices do not incorporate and use a controlled set of hydraulic conditions to assure fish guidance, as does the positive screen/bypass system. The devices can actually encourage fish movement that actually contrasts with the expected rheotactic response. Thus, the fish gets mixed signals about what direction to move. Another concern is repeated exposure; a fish may no longer react to a signal that initially was an attractant or repellant. In addition to the vagaries in the response of an individual fish, behavior variations are expected due to size, species, life stage, and water quality conditions.

In strong or accelerating water velocity fields, the swimming ability of a fish may prevent it from responding to a stimulus even if it attempts to do so. Other environmental cues (e.g., pursuing prey, avoiding predators, or attractive habitat) may cause a fish to ignore the signal.

A main motivation for opting to install behavioral devices is cost-savings. However, much of the cost in conventional systems is for the physical structure needed to provide proper hydraulic conditions. Paradoxically, complementing a behavioral device with its own structural requirements may lessen much of its cost advantage.

Present skepticism over behavioral devices is supported by the fact that few are currently being used in the field and those that have been installed and evaluated seldom exhibit consistent guidance efficiencies above 60 percent [Vogel, 1988, EPRI, 1986]. The louver system is an example of a behavioral device with a poor success record. In this case, even with the use of favorable hydraulics, performance is poor especially for smaller fish. Entrainment can be high, particularly when operated over a wide range of hydraulic conditions [Vogel, 1988, Cramer, 1982, Bates, 1961]. Due to their poor performance, some of these systems are already replaced by positive barriers.

EXPERIMENTATION PROCESS

However, there is potential for developing new positive screens as well as behavioral guidance devices for the future. Nonetheless, experimental technology must achieve, over the foreseeable range of adverse conditions, a consistent level of success that equals or exceeds that of best available technology. It should be a deliberate, logical process. NMFS will not discourage research and development on experimental fish protection devices if the following tiered study process is incorporated:

(1) Consider earlier research. A thorough review should be performed of past methods similar to that proposed. Reasons for substandard performances of these earlier methods should be clearly identified.

(2) Study plan. A study plan should be developed and presented to NMFS for review and concurrence. It is essential that tests occur over a full range of possible hydraulic, biological, and ecological conditions that the device is expected to experience.

(3) Laboratory research. Controlled laboratory experiments should be developed using species, size, and life stages intended to be protected (or acceptable surrogate species). For behavioral devices, special attention must be directed at providing favorable hydraulic conditions and demonstrating that the device clearly causes the planned behavioral response. Studies should be repeated with the same test fish to examine any habituation to the stimulus.

(4) Prototype units. Once laboratory tests show high potential to equal or exceed success rates of state-of-the-art screening, it is appropriate to further examine the new device as a prototype under real field conditions. Field sites must be fully appropriate to (1) demonstrate all operational and natural variables expected to influence the device performance, (2) evaluate the species, or an acceptable surrogate, that would be exposed to the device under full operation, and (3) avoid unacceptable risk to resources at the prototype locations.

(5) Study results. Results of both laboratory tests and prototype devices examined in the field must demonstrate a level of performance equal to or exceeding that of conventional, established technology before NMFS will support further installations.

CONCLUSIONS

In the course of the past few decades, we have seen increased demand for water diversions. This trend is likely to continue. Accompanying this demand is a corresponding decline of fisheries. Therefore, prudence dictates that fish protection facilities be held to the highest practicable level of performance.

A major effort was made to examine experimental guidance systems over several decades by a variety of funding agencies. The results were generally poor or inconclusive, with low guidance efficiencies attributable to the particular device used. Often results were based on a small sample size or varied with operational conditions. In addition, unforseen operational and maintenance problems, including safety hazards, sometimes developed.

Nevertheless, some of these experiments show potential. To further improve fish protection technology, NMFS will not oppose tests that proceed in the tiered process outlined above. Further, to ensure no further detriment to fish, experimental field testing should be done with the simultaneous design of a positive barrier and bypass system for that site. This conventional system should be scheduled for installation immediately, if the experimental guidance system, once again, does not prove to be as effective as a conventional system.

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Enclosure 2

MIRANT DELTA, LLC'S - AQUATIC FILTER BARRIER, DREDGING, AND ENHANCEMENT PROJECTS

ESSENTIAL FISH HABITAT CONSERVATION RECOMMENDATIONS (Magnuson-Stevens Fishery Conservation and Management Act - EFH Consultation)

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) set forth new mandates for the National Marine Fisheries Service (NOAA Fisheries), regional fishery management councils, and federal action agencies to identify and protect important marine and anadromous fish habitat. The Councils, with assistance from NOAA Fisheries, are required to delineate "essential fish habitat" (EFH) in fishery management plans (FMPs) or FMP amendments for all managed species. Federal action agencies which fund, permit, or carry out activities that may adversely impact EFH are required to consult with NOAA Fisheries regarding potential adverse effects of their actions on EFH, and respond in writing to NOAA Fisheries' conservation recommendations. In addition, NOAA Fisheries is required to comment on any state agency activities that would impact EFH. Although the concept of EFH is similar to that of "Critical Habitat" under the Endangered Species Act, measures recommended to protect EFH are advisory, not proscriptive.

The Pacific Fisheries Management Council has delineated EFH for west coast groundfish (PFMC 1998a), coastal pelagic species (PFMC 1998b), and Pacific Coast salmon (PFMC 1999). The Chinook salmon (*Oncorhynchus tshawytscha*) is present within the action area, defined in the proceeding biological opinion, of the Contra Costa Power Plant. Species within the action area of the Pittsburg Power Plant which require EFH consultation are starry flounder (*Platichthys stellatus*), northern anchovy (*Engraulis mordax*), and Chinook salmon (*Oncorhynchus tshawytscha*). Activities at the Montezuma Enhancement Site will affect all of the above mentioned species.

I. IDENTIFICATION OF ESSENTIAL FISH HABITAT

Essential fish habitat is defined in the MSA as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity...". NOAA Fisheries regulations further define "waters" to include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" to include sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" to mean the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" to cover a species' full life cycle.

The geographic extent of EFH for coastal pelagic species and west coast groundfish includes waters, substrates and biological communities within bays and estuaries of the Pacific coast

seaward from the high tide line (MHHW) or extent of upriver saltwater intrusion. This includes waters of Suisun Bay and Marsh which are within the action area of the preceding biological opinion.

For Pacific coast salmon, the geographic extent of EFH includes both marine and freshwater habitat. For purposes of this consultation, Pacific coast salmon EFH corresponds to "Critical Habitat" designated under the Endangered Species Act for Sacramento River winter-run Chinook salmon (58 FR 33212) and Central Valley spring-run Chinook salmon (65 FR 7764).

LIFE HISTORY AND HABITAT REQUIREMENTS

Chinook Salmon

General life history information for Chinook salmon is summarized in the associated biological opinion. Further detailed information on Chinook salmon ESUs are available in the NOAA Fisheries status review of Chinook salmon from Washington, Idaho, Oregon, and California (Myers et al. 1998), and the NOAA Fisheries proposed rule for listing several ESUs of Chinook salmon (National Marine Fisheries Service (NMFS) 1998).

Population trends for Sacramento River winter-run and Central Valley spring-run Chinook salmon are also presented in the preceding biological opinion. Trends in abundance of Central Valley fall-/late fall-run Chinook salmon within the Sacramento and San Joaquin River Basins and Delta are mixed, but the number of natural spawners has been quite high (5-year geometric mean was 190,000 natural spawners for the Sacramento River Basin). Populations in the San Joaquin Basin have experienced booms and busts but currently appear to be on an upward trend in abundance.

Starry Flounder and Northern Anchovy

Starry flounder are an important member of the inner continental shelf and shallow sublittoral communities. Most spawning occurs in estuaries or sheltered inshore bays, in less than 45 m of water. Eggs and larvae are epipelagic; juveniles and adults are demersal. Eggs occur at or near the surface over water 20-70 m deep. Larvae are found in estuaries to 37 km offshore. Juveniles are found in estuaries and the lower reaches of major coastal rivers. Adults also occur in estuaries or their freshwater sources year-round. Juveniles prefer sandy to muddy substrates, and adults prefer sandy to coarse substrates. Eggs are found in polyhaline to euhaline waters; juveniles are found in mesohaline to fresh water; adults and larvae are found in euhaline to fresh water. Starry flounder are not considered to be a migratory species. However, adults move inshore in late winter-early spring to spawn and offshore and deeper in the summer and fall, but these coastal movements are generally less than 5 km. Adults and juveniles are known to swim great distances up major coastal rivers (>120 km) but not following any migratory trend. In California, starry flounder spawn from November-February, peaking in December. Larvae are planktivorous. Juveniles and adults are carnivorous. Large fish feed on a wider variety of items, including crabs and other more mobile foods. In other areas, clams and benthic fishes are an important part of the starry flounder's diet.

Northern anchovy are small, short-lived fish typically found in schools near the surface. They rarely exceed four years of age and 18 cm total length. They eat phytoplankton and zooplankton by either filter feeding or biting, depending on the size of the food. Sexual maturity occurs at age two. Spawning occurs during every month of the year, increasing in late winter and early spring, peaking from February to April. Preferred spawning temperature is 14°C and eggs are most abundant at temperatures of 12°C to 16°C. Females spawning batches of eggs throughout the spawning season at intervals as short as seven to ten days. Both eggs and larvae are typically found near the surface.

II. PROPOSED ACTION.

The proposed actions (i.e., the Contra Costa Power Plant and Pittsburg Power Plant Aquatic Filter Barriers, the Dredging Project at the Pittsburg Plant, and development of the Enhancement Site) are described in Part II of the associated biological opinion.

III. EFFECTS OF THE PROJECT ACTIONS

The following is a general description of the non-fishing related activities that directly or cumulatively, temporarily or permanently may threaten the physical, chemical and biological properties of the habitat utilized by west coast groundfish species (starry flounder), coastal pelagic species (northern anchovy) or Pacific coast salmon and their prey within the proposed project area. The direct result of these threats is that the function of EFH may be eliminated, diminished or disrupted.

Potential impacts to Pacific coast salmon EFH, specifically as it relates to Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon, due to the proposed action have been described in the associated biological opinion. These potential impacts would also apply to Central Valley fall and late-fall run Chinook salmon.

Both starry flounder and northern anchovy are abundant in San Francisco Bay/Delta. However, starry flounder is a benthic species found in the Pittsburg Plant project area, and thus is more likely to be affected by implementation of the dredging and placement of the aquatic filter barrier than the northern anchovy, which is a pelagic, schooling species. Starry flounder is likely to benefit from the increased abundance of tidal marsh habitat resulting from construction of the enhancement site at Montezuma. Adverse effects of the proposed action on starry flounder or northern anchovy EFH may occur from project construction activities or operation that result in loss of habitat. The placement of the AFB and dredging activities may result in a loss of habitat abundance or quality due to noise and disturbance, but the impacts to starry flounder or northern anchovy are unknown. Various life stages of west coast groundfish or coastal pelagic species may be affected through entrapment or impingement on intake screens.

IV. CONCLUSION

Upon review of the anticipated effects of the Pittsburg Power Plant Project Description, NOAA Fisheries believes that the proposed action is likely to adversely affect EFH for Pacific coast salmon, west coast groundfish, or coastal pelagic species.

V. EFH CONSERVATION RECOMMENDATIONS

Pursuant to Section 305(b)(4)(A) of the MSA, NOAA Fisheries recommends that certain Reasonable and Prudent Measures and their Terms and Conditions included in the biological opinion be adopted as the EFH Conservation Recommendations.

Contra Costa Power Plant

1. The Corps shall ensure that impacts resulting from project construction and operation of the AFB are minimized. The maximum reduction in impingement and entrainment-related fish mortality shall be achieved.

Pittsburg Power Plant

1. The Corps shall ensure that during VSD mode all fish screens shall be operated to achieve maximum reduction in impingement-related mortality.

2. The Corps shall ensure that impacts resulting from dredging at the PPP are minimized.

3. Placement of aquatic filter barrier at PPP will be dependent upon successful deployment and operation of a similar structure at the CCPP.

Montezuma Enhancement Site

1. The Corps shall ensure that the Enhancement Site goals outlined in the conservation plan are achieved.

2. The Corps shall ensure that impacts resulting from the construction and monitoring activities at the enhancement site are minimized.

Terms and Conditions

Contra Costa Power Plant

1. The Corps shall ensure that impacts resulting from project construction and operation of the AFB are minimized:

a. Anchor placement at or below the water surface or other in-water construction activities, including deployment of the AFB curtain shall occur between June 1 and October 31 to minimize the effects on listed fish species.

b. Best management practices shall be employed during construction activities or operation of the AFB to avoid and minimize vegetation removal, erosion, or siltation. Anchors must be composed of plastic, concrete, or steel, and be free of coatings or treatments that may leach into the surrounding environment and adversely affect listed species.

c. The Corps should observe the protocol for study plans, research, and analysis of study results contained in NOAA Fisheries policy guidance: Experimental Fish Guidance Devices (Attachment 1 of the Biological Opinion).

d. The Corps must coordinate all AFB activities with NOAA Fisheries-SWR Engineering Team Leader:

Rick Wantuck
NOAA Fisheries Santa Rosa Area Office
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404-6515
Phone: (707)575-6063

Pittsburg Power Plant

1. The Corps shall ensure that during VSD mode all fish screens shall be operated to achieve maximum reduction in impingement-related mortality.

a. Fish screens at the power plant shall be rotated at least once every four hours during plant operation.

2. The Corps shall ensure that impacts resulting from dredging at the PPP are minimized.

a. All dredging will be conducted shall occur between June 1 and October 31 to minimize the effects on listed fish species.

3. Placement of aquatic filter barrier at PPP will be dependent upon successful deployment and operation of a similar structure at the CCPP.

a. Monitoring will be conducted and evaluated for a period of three years at CCPP before determining applicability at the PPP.

b. Monitoring results will be evaluated by a team of Service, CDFG, and Corps biologists to determine if they are sufficient to deem AFB placement at PPP appropriate. The final decision on the placement of an AFB at PPP will be made by the USFWS, NOAA Fisheries, and CDFG.

Montezuma Enhancement Site

1. The Corps shall ensure that impacts resulting from the construction and monitoring activities at the enhancement site are minimized and that enhancement site goals are achieved.

a. Best management practices shall be employed during construction activities to avoid and minimize vegetation removal, erosion, or siltation.

b. All construction and monitoring plans will be developed and reviewed in consultation with the USFWS, NOAA Fisheries,, CDFG, and the permittee.

c. A qualified, NOAA Fisheries approved, fishery biologist shall be present for and supervise all monitoring activities.

d. All in-water construction at the enhancement site shall be conducted during the period of July through August to minimize potential take of juveniles.

2. The Corps shall ensure that the Enhancement Site construction is completed within three years of the issuance of this Biological Opinion.

a. A design team shall be established within six months of the issuance of the biological opinions.

b. Within one year of the issuance of the biological opinions a design for the enhancement site shall be submitted to the USFWS, NOAA Fisheries, and CDFG for review.

c. Annual reports shall be submitted to NOAA Fisheries to describe the progress of the project and expected milestones. Reports shall be submitted to:

Supervisor, Protected Resources Division
National Marine Fisheries Service
Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814-4706

VI. FEDERAL LEAD AGENCY STATUTORY REQUIREMENTS

The MSA (Section 305[b][4][B]) and Federal regulations (50 CFR Section 600.920[j]) to implement the EFH provisions of the MSA require federal action agencies to provide a written response to EFH Conservation Recommendations within 30 days of its receipt. The federal action agency included in this consultation is the Army Corps of Engineers. A preliminary response is acceptable if final action cannot be completed within 30 days. The final response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts

of the activity on delineated EFH. If the response is inconsistent with our EFH Conservation Recommendations, the action agency must provide an explanation of the reasons for not implementing the recommendations.

VII. REFERENCES

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